MITSUBISHI ELECTRIC

Frequency
Inverter

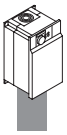
FR-F 740 EC/E1

Technical Catalogue

2004/2005

The new FR-F 740 inverter series

The Power-Saving Inverters



The new FR-F 740 frequency inverters are available with outputs from 0.75 – 630 kW and are ideal for applications with pump and fan drives.

They use a 3-phase AC power supply and have an output frequency range of 0.5 – 400 Hz.

Further Publications within the Factory Automation Range

Technical Catalogues

Technical Catalogues Frequency Inverters

Product catalogue for frequency inverters and accessories of the FR-S 500, FR-E 500 and FR-A 500 series

Technical Catalogues MELSERVO and Motion Controllers

Product catalogues for MR-J2 series amplifiers, servo motors and motion controllers with SSCNET connection

PLC Technical Catalogues

Product catalogues for programmable logic controllers and accessories for the MELSEC series

Networks Technical Catalogue

Product catalogue for Master and Slave modules as well as accessories for the use of programmable logic controllers in open networks and MELSEC networks

HMI Technical Catalogue

Product catalogue for operator terminals, process visualisation and programming software as well as accessories

Additional Services

You will find current information on updates, alterations, new items and technical support on MITSUBISHI ELECTRIC's web pages (www.mitsubishi-automation.com).

The products section of the MITSUBISHI home site includes various documents for the whole product range offered by MITSUBISHI ELECTRIC as well as the current version of this catalogue. All manuals and catalogues can be downloaded for your convenience. Manuals and catalogues are available in multiple language. Please check for availability.

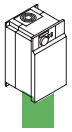
About this product catalogue

Due to the constantly growing product range, technical alteration, and new or changed characteristical features, this catalogue is updated frequently.

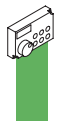
Texts, figures and diagrams shown in this product catalogue are intended exclusively for explanation and assistance in planning and ordering the frequency inverter series FR-F 700 EC/E1 and the associated accessories. Only the manuals supplied with the units are relevant for installation, commissioning and handling of the units and accessories. The information given in these documentations must be read before installation and commissioning of the units or software.

Should questions arise with regard to the planning of modules described in this product catalogue, do not hesitate to contact your nearest office listed on the last page of this document.

FREQUENCY INVERTER FR-F 740 EC/E1



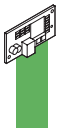
SYSTEM DESCRIPTION



OPERATION

PARAMETERS

PROTECTIVE FUNCTIONS



APPLICATIONS

ACCESSORIES

DIMENSIONS

APPENDIX

The FR-F 740 Frequency Inverter

Mitsubishi Electric's FR-F 740 series is a completely new range of frequency inverters with truly exceptional power conservation capabilities. These inverters are ideal for pumps, ventilation fans and applications with reduced overload requirements such as:

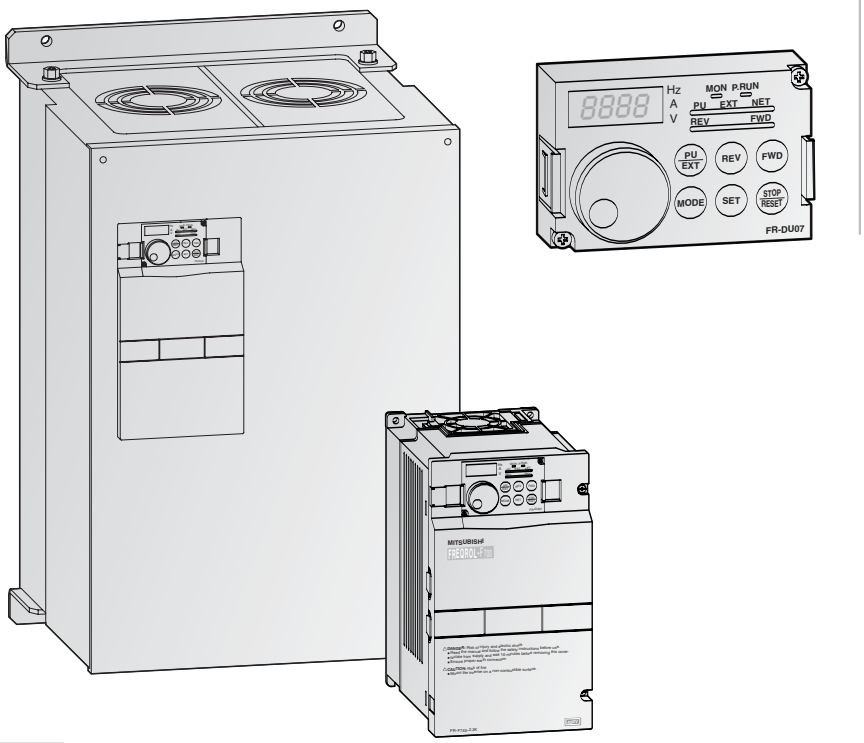
Air conditioning systems, e.g. in building management

- Air extraction systems
- Fans and blowers
- Hydraulics systems
- Compressors
- Sewage and drains systems
- Ground water pumps
- Heat pumps
- Drive systems with high idling rates

These inverters are very user-friendly and they are available with output ratings matched to users' real needs.

The FR-F 740 is available in versions with outputs from 0.75 – 640 kW. All the inverters in the series are designed for connection to 3~ 380–480 V/500 V (50/60Hz) power supplies.

The output frequency range is 0.5 – 400 Hz.



Proven Technology with Advanced New Capabilities

Innovative performance optimisation

The drive performance of the FR-F 740 series is optimised for the special needs of fan and pump applications. Drives in applications like these are characterised by a load torque curve that increases by the square of the motor speed (variable curve). Of course, these frequency inverters can also be used for standard applications with constant load curves and a maximum overload of 150%.

The outstanding features and characteristics of the FR-F 740 series include:

- Power-saving mode with display of the energy savings
- PID control
- Extended PID control with sleep and multi-motor switching functions
- Flexible 5-point V/f curve
- Continued operation after brief power failures
- Automatic restart after instantaneous power failures
- Flying start
- PTC temperature sensor input
- Switch motor to direct mains operation
- Active current limiting
- Optimum excitation control
- Regeneration avoidance function
- Traverse function
- Disable defined frequency ranges
- Selectable 2nd parameter set for different load characteristics
- Network support

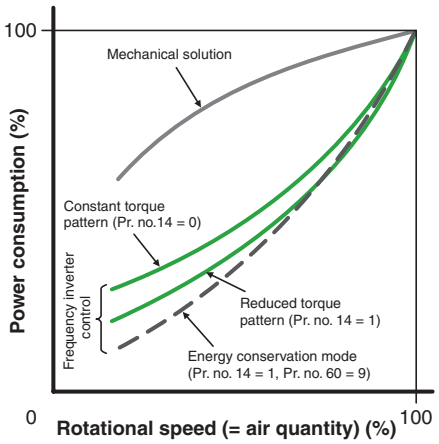
Intelligent Technology that Cuts Power Consumption

Saving power with Mitsubishi frequency converters

Reducing consumption and optimising the utilisation of our valuable energy resources is one of the greatest global environmental challenges of our age.

Energy conservation mode is a standard feature of the intelligent controller. It dynamically adjusts the voltage to motor requirements, eliminating unnecessary power losses, which helps to further reduce power consumption. Frequency inverters are particularly effective at conserving energy when they are used to control pumps and fans.

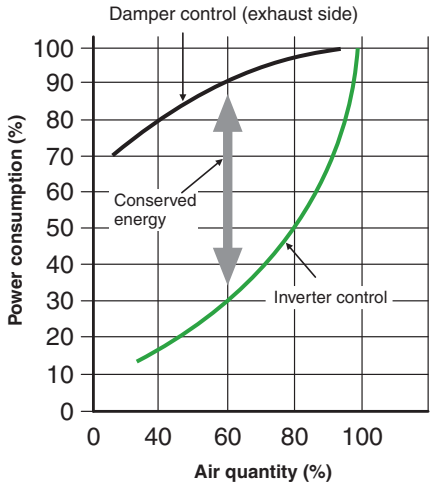
The amount of energy conservation (hysteresis) depends on the speed/torque fluctuations. The graph below provides an impressive example of the results of intelligent control in a fan system.



How do frequency inverters conserve energy?

The illustration below shows a blower system in which the air flow is regulated by controlling the motor with a frequency inverter instead of with a damper on the exhaust side.

The graph below compares the motor power consumption of the frequency inverter and damper solutions. At a flow rate of 60% the curve shows that the frequency inverter system consumes a full 60% less power than the motor with the damper system.



Potential savings

In addition to the ecological benefits frequency inverters can also save a great deal of money by radically cutting power consumption.

Example:

Based on the graph on the left and an electricity price of 14 cents per kWh, the following savings can be achieved with a system using a 75 kW motor:

- *Conventional mechanical solution*
  At an air throughput of 60% the power consumption is 90%, resulting in the following annual costs:

  75 kW x 0.9 x €0.14 x 24 h x 365 days = €82,782
- *Frequency inverter solution*
  At an air throughput of 60% the power consumption is 30%, resulting in the following annual costs:

  75 kW x 0.3 x €0.14 x 24 h x 365 days = €27,594

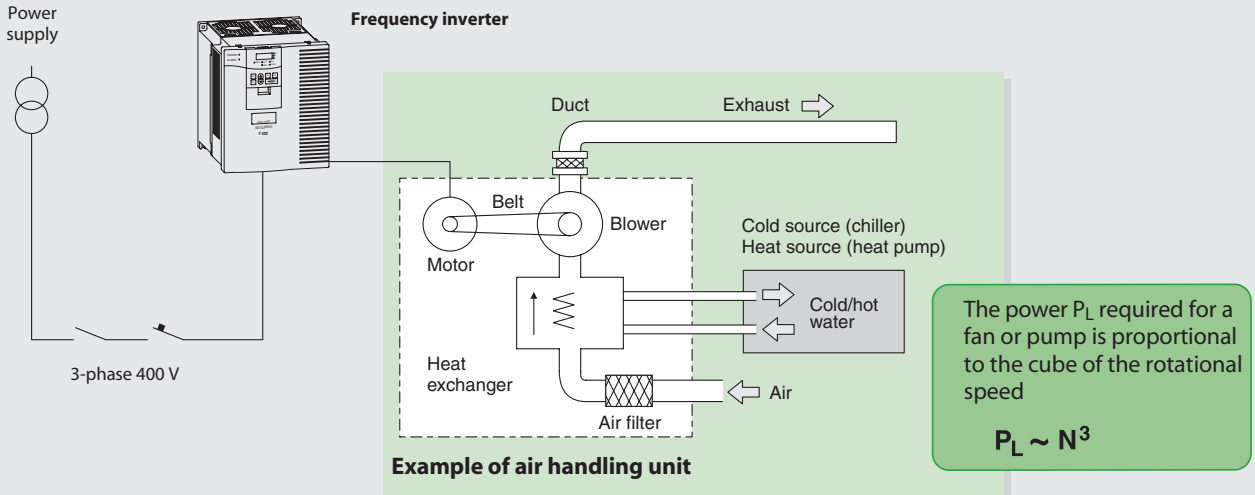
This means that the inverter solution saves €55,188 per year compared to the conventional mechanical system!

Clearly, a frequency inverter will pay for itself in a very short time – and one must also remember that the potential savings increase with the power ratings of the motors used.

Energy savings control

The effect of energy savings can be confirmed using the control panel, via the output terminals (CA, AM) and via networks (network option required) with the newly developed energy saving monitor.

Application with potential for power savings



Intelligent Motor Control Functions

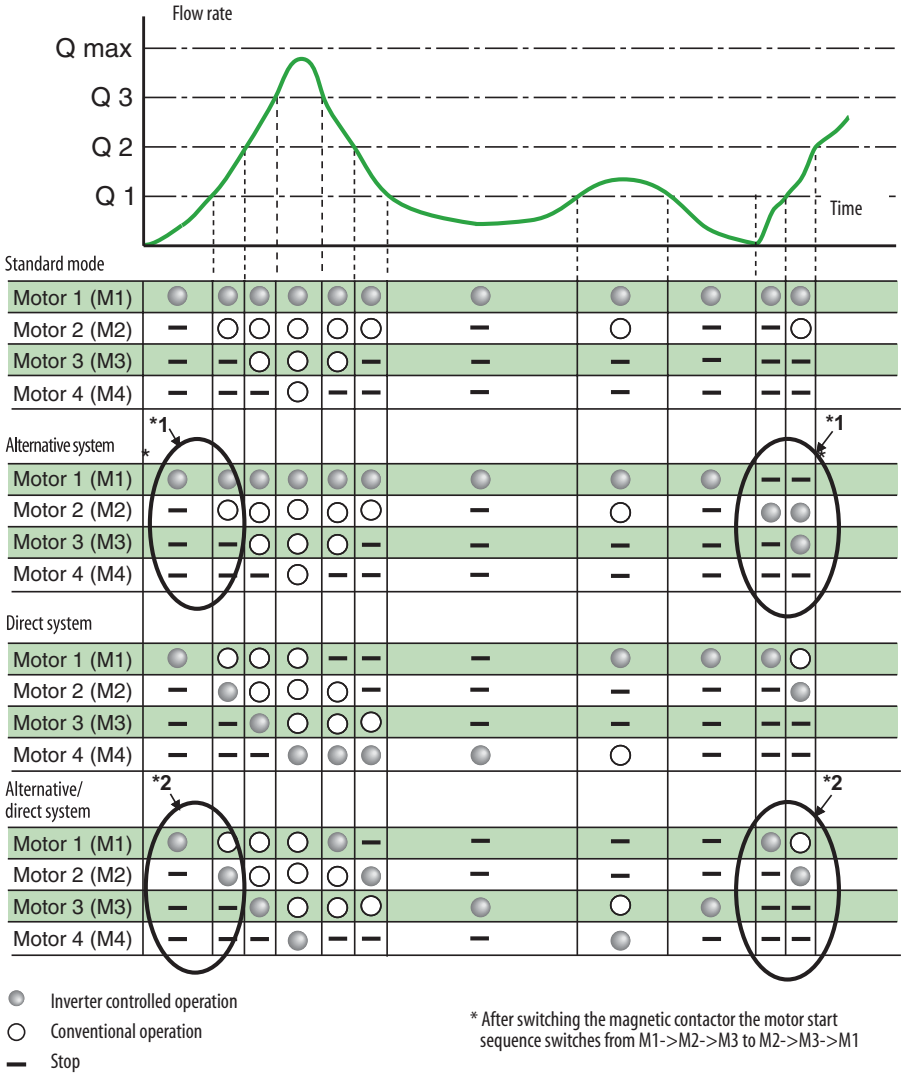
Extended PID control

The FR-F 740 series supports extended PID control. This feature makes it possible to connect the process status signal to the frequency inverter as a voltage signal (0–10 V DC) or a current signal (0/4–20 mA DC) and then use the analog input calibration function of the inverter to compensate minor controller-related fluctuations.

In addition to this the frequency inverter can also control up to four motors successively. This function is programmable; for example, you can program it so that only one motor is frequency-controlled and the others are switched on and off under direct mains power as required, or you can alternate between direct mains power and frequency control for all four motors.

The graph on the right illustrates this multi-motor switching function with a typical example.

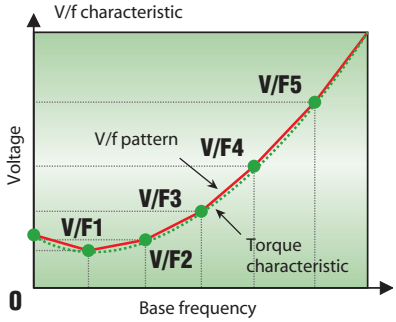
When implementing an application like this you must plan the necessary number of magnetic power contactors and the required number of output signal terminals on the inverter. Care must also be taken to ensure that the mains power is never switched to the inverter output.



Flexible 5-point V/f curve

The integrated flexible 5-point V/f curve enables you to match the torque curve perfectly to the characteristics of your machine.

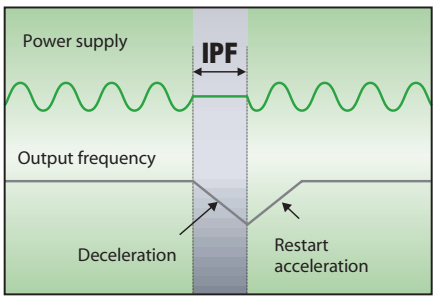
Together, the optimum excitation control feature and the 5-point V/f curve achieve significantly increased power savings.



Automatic restart after instantaneous power failures

In pump and fan applications normal operation can be continued automatically after brief power failures. The system simply reactivates the coasting motor and automatically accelerates it back up to its setpoint speed.

The graphic on the right shows how the frequency inverter can respond to a brief power outage. Instead of coasting down completely and stopping, the motor is automatically "caught" by the frequency inverter and re-accelerated back up to its previous speed.



Innovative Features and Functions

Flying start

Gentle restart of a rotating motor (e.g. fan rotated by a draft), also in the opposite direction.

PTC temperature sensor input

The motor's internal PTC temperature sensor can be connected to the inverter directly. In combination with the electronic temperature monitoring system this provides effective protection for the motor.

Active current limiting

Tried and tested capabilities like the active current limiting feature have been retained. The characteristics of the current limiter have now been further improved to prevent unwanted triggering in response to overcurrents. Transient overcurrents, for example those generated when a motor coasting in reverse is restarted or when an input contactor is closed, will no longer cause unwanted triggering of the current limiter.

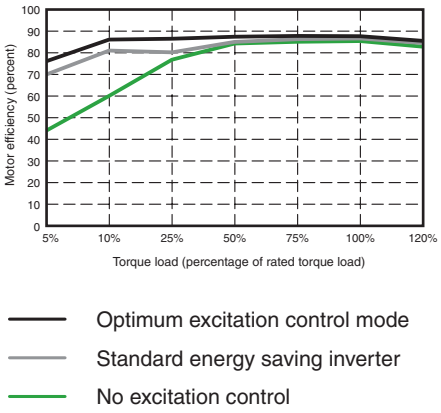
Magnetic flux vector control

The integrated motor flux vector control system makes it possible to achieve high torques, even at low motor speeds.

Optimum excitation control

You can also select the optimum excitation control mode, which achieves yet more power savings compared to conventional inverters designed for pump and fan applications.

The graph below demonstrates the kind of improvements that are possible with this control mode:



Regeneration avoidance function

This function can prevent the inverter from being shut down by regenerative overvoltages when strong regenerative loads cause power to be released into the frequency inverter (for example when braking the motor or with loads that actively drive the motor).

The inverter can automatically increase the output frequency or disable the braking ramp when a programmed threshold value is reached. The response sensitivity, dynamics and working range are all adjustable.

For example, this function can prevent a shutdown with an overvoltage error when the speed of a fan controlled by the inverter is increased by the draft from another fan operating in the same ventilation duct. The function then temporarily increases the output frequency above the setpoint value.

This function can also be used to brake loads with the DC bus voltage, without using braking modules.

Switching to direct mains operation

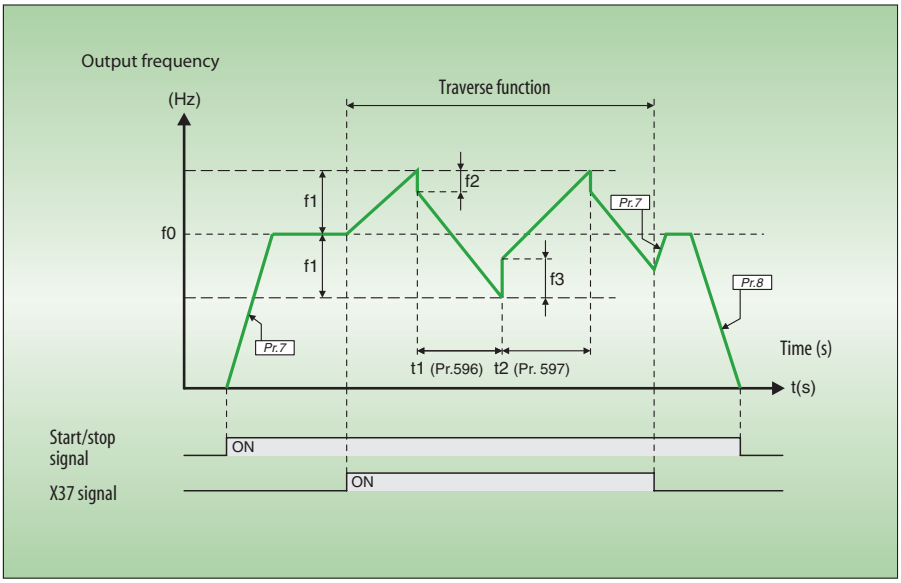
You can switch the motor to direct mains operation by programming the contactor relays accordingly and applying a control signal to terminals L11 and L21 of the inverter.

Traverse function

The traverse function of the FR-F740 is designed specifically for use in yarn-winding applications in the textile industry.

This function performs a cyclical variation of the output frequency as shown in the graph on the right. The width of the fluctuation around the frequency setpoint value and the ramp times are configurable via setup parameters.

This function prevents the formation of the unwanted "bands" in the wound yarn.



Extensive Communications Support

Extended I/Os for additional control functions

The following I/Os are included as standard equipment on the FR-F 740:

- 12 contact inputs
- 3 analog inputs
- 5 open collector outputs
- 2 relay outputs
- 2 analog outputs

The contact inputs, open collector outputs and relay outputs can all be used for a wide range of functions.

Two of the analog inputs can be switched from current to voltage. The switching status of the input and output terminals can be displayed on the control panel.

Remote I/Os

Instead of using the remote I/Os of a PLC you can use a network connection to both read out the status of the frequency inverter's inputs and set its outputs.

Expansion slot

The frequency inverter has an expansion slot that can be used to install an I/O expansion module or a network module. These modules are cards that are installed by plugging them into the slot in the inverter. See page 34 for a list of available modules.

Extended networking capabilities

The inverter comes with two serial ports as standard equipment for integration in an automation network. You can connect a standard RJ45 network cable to the PU connector. there are also RS-485 terminals inside the inverter unit for connection to a multidrop network via a normal cable, which enables inexpensive networking of up to 32 nodes.

In addition to the Mitsubishi protocol you can also use the Modbus RTU (binary) protocol.

Programming via USB

You can configure the setup parameters and monitor the frequency inverter via an USB port with the optional USB 1.1 module.

Support for integration in larger networks

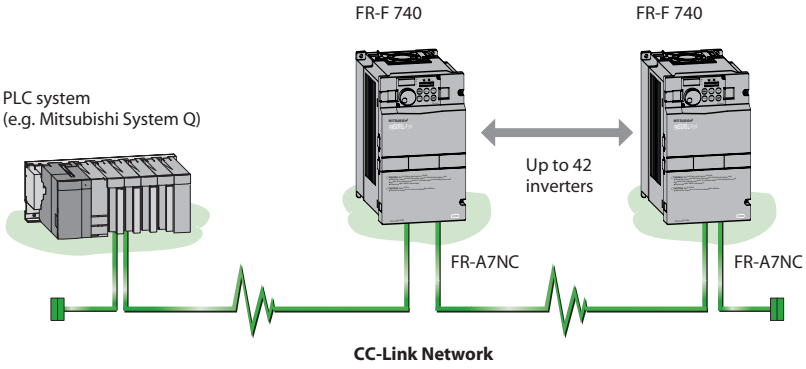
Open communications with standard industrial bus systems can be implemented easily with optional expansion cards.

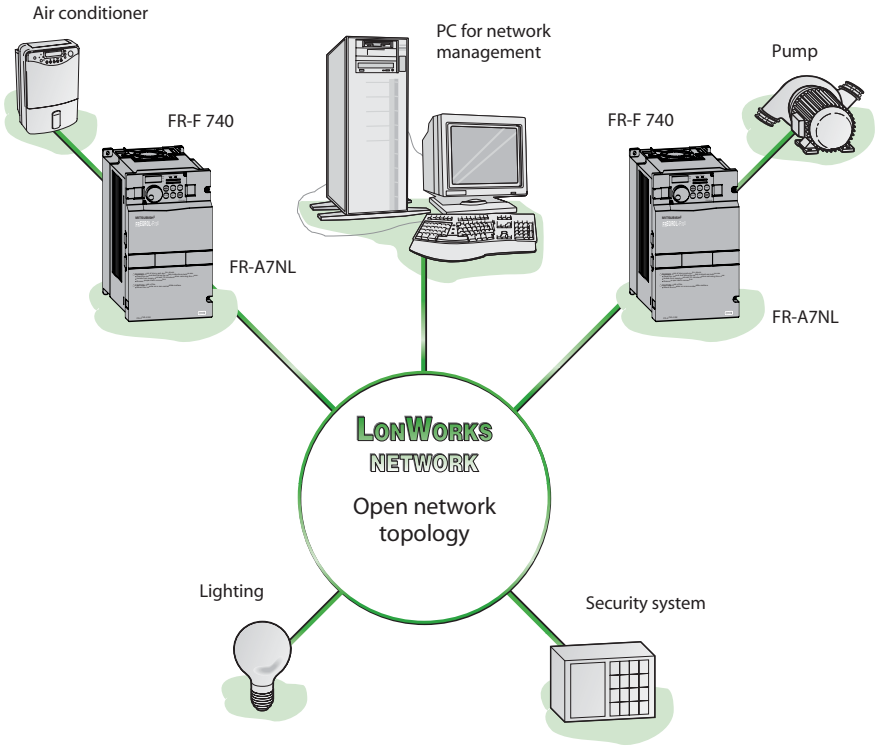
This makes it possible to integrate the frequency inverter in large-scale automation systems.

The following networks are supported by the FR-F 740:

- CC-Link
- Profibus/DP
- DeviceNet
- LON Works
- RS485 and Modbus RTU (standard)

You can find a description of the network cards on page 34.





Environment-Friendly and Internationally Compatible

Electromagnetic compatibility

New technologies have been used to significantly reduce the interference levels generated by this frequency inverter.

The FR-F 740 EC conforms to the strict electromagnetic compatibility regulations of the European Union (EMC Directive, Environment 2). In order to meet these standards the FR-F700 inverters are fitted with a new, integrated interference suppression filter, which can easily be deactivated with a jumper if necessary.

You can also further limit the make current and reduce network interference by fitting the input of the inverter with an optional AC reactor and a DC reactor, which is connected to special terminals on the inverter unit.

The DC reactor is included as standard equipment with models 00180 and above and must be used with them.

Circuit boards with two coats of protective varnish

The frequency inverters with the E1 designation (standard, type 02160 and above) have circuit boards with two coats of protective varnish.

This feature is available as an option for the models up to type 01800. The twin coating on the internal PCBs provides even better protection against environmental influences. This is particularly important in applications sewage plants where the switchgear cabinets are exposed to aggressive fermentation gases that can reduce the service life of the equipment.

International standards

The inverters of the FR-F 740 EC series are designed so that they can be used worldwide without any additional modifications or certifications.

- The units conform to the international CE, UL, cUL, Gost and CCC standards.
- User-selectable positive or negative switching logic. Users can select positive or negative switching logic for input and output signals, enabling flexible and simple adaptation of the units for varying world market requirements.
- Extended input power voltage range: 3~ 380-480 V (up to 500 V for 01800 and above), 50/60 Hz
  Tolerance: –15%; +10%
- Multilingual programming/control unit (optional)
- Support for a variety of international industrial bus systems
- Internationally standardised, frequency inverter configuration software package for MS Windows, with multilingual user interface

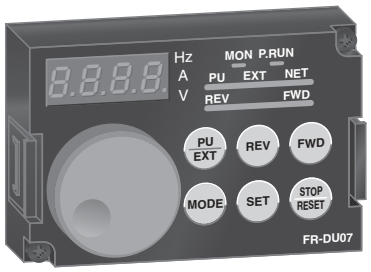
These features make the FR-F 740 EC a truly international product that meets all relevant standards and can be easily adjusted for national requirements.

User-friendly Operation

Easy configuration with control panel or software

The **FR-DU07** control panel is included as standard equipment with all the inverters of this series. It makes operation of the inverter simple and intuitive and displays operating parameters and alarm messages. The jog shuttle "digital dial" control provides fast and efficient access to all key drive parameters.

The optional **FR-PU04** control panel features a long-life LC-display with a backlight and integrated numeric keypad for direct entry of operating parameters. The user interface can be displayed in eight different languages. This panel is designed as a remote unit that is connected to the inverter with a cable. It also supports definition of user groups with which you can implement editable parameter sets that can then be selected as required for specific applications.



FR-DU07

FR-PU04

In addition to control panel operation the frequency inverter can also be connected to a standard PC via an RS-485 port and operated from the PC with the optional VFD setup software package. Using this software you can configure, operate and monitor multiple frequency inverters, either in a network or directly from a single PC or notebook computer. (See page 21 for more details on this software package.)

User-friendly

In addition to allowing you to enter and display configuration and control parameters the integrated control panel can also be used to monitor and display current operating data and alarm messages. The information is output on a 4-digit LED display.

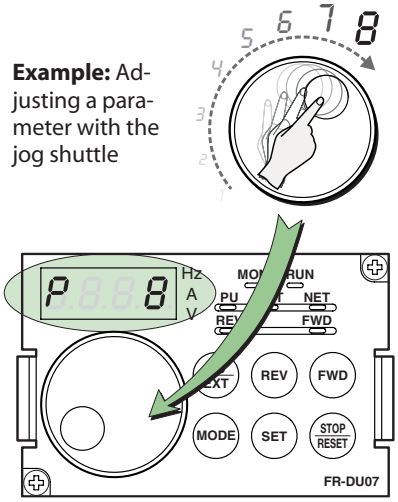
You can monitor all the current status parameters of both the inverter itself and the connected motor. Problems and malfunctions are indicated by error codes.

One-touch operation

Simple and intuitive configuration and operation save both time and money. The control panel's jog shuttle "digital dial" control provides much faster access to all key drive parameters than would be possible with conventional buttons and keys.

You can also use the dial to continuously adjust the speed of the connected motor.

Example: Adjusting a parameter with the jog shuttle



Removable panel with parameter copy function

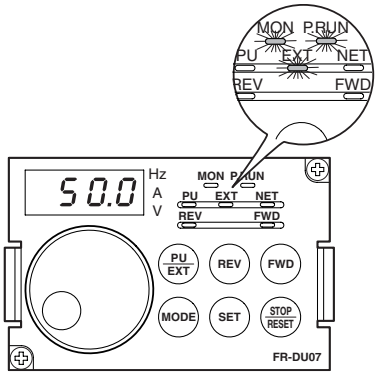
The control panel is removable and can also be connected installed remotely, for example in the door of a switchgear cabinet. It also features a useful copy function with which you can copy the parameter settings of one frequency inverter to another.

Alarm log

The control panel stores an alarm log for up to 8 alarm messages that can be displayed and checked on the panel. The alarm details in the log include frequency, current, voltage and cumulative operating time at the time of the alarm.

Switch between direct and external control

The frequency inverter can be controlled directly via the control panel (PU mode) or via external signals (EXT mode).



Long Service Life and Easy Maintenance

New components for longer service life

The components of this new generation of frequency inverters are specified for a service life of 10 years (mean annual ambient temperature 40°C, 80% load in an environment free of aggressive gases, flammable gases, oil mist, dust and dirt). Among other things, this is made possible by the newly-developed, long-life cooling fans that are monitored by the inverter. The life of the cooling fans can also be made significantly longer by using Parameter 244, which controls the selective shutdown feature.

Modern diagnostics functions further extend service life

The ageing of the main circuit capacitors, the control circuit power capacitor, the internal cooling fans and the inrush current limiter circuit can be checked with the monitoring functions. If the inrush resistor overheats an alarm is displayed.

The alarms for the main circuit capacitors, control circuit capacitor, inrush current limiter and internal fans can all be output to a network or via the optional FR-A7AY module.

This makes it possible to prevent malfunctions by configuring diagnostics alarms to be triggered when the end of the service life is reached.

The inverter also has an internal program that can evaluate the ageing of the main circuit capacitors. This feature is only available when a motor is connected to the inverter.

Service timer

The frequency inverters of this series all have an integrated service timer that automatically triggers an alarm after a set number of operating hours. This feature can be used for monitoring the frequency inverter itself or a peripheral component. The values of the mean output current and the service timer can also be output as analog signals.

Improved handling

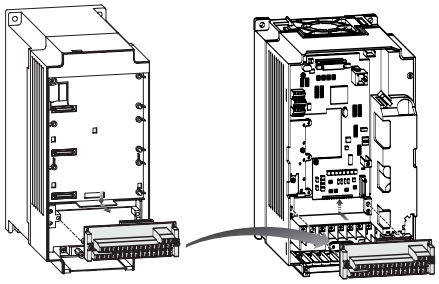
The main cooling fan is easily accessible at the top of the inverter unit, allowing quick and easy replacement without removal of the connection cables.

The cable guide comb (see illustration) is removable and makes routing the cables quick and trouble-free. After the cables have been connected the cover can then be replaced (for frequency inverters up to type 00620).

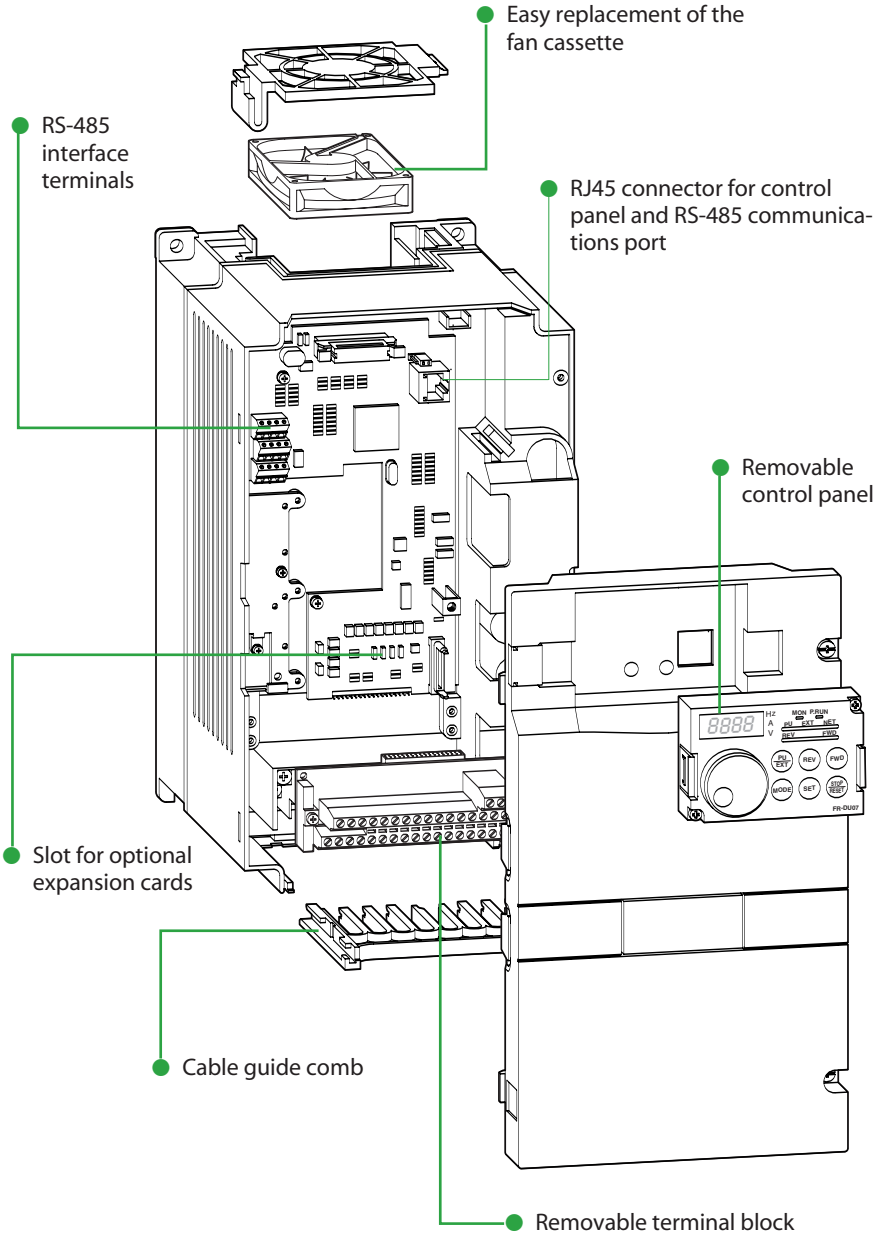
Easy replacement

The terminal block for the control circuit connections is removable to enable easy replacement of the inverter unit for servicing, which greatly facilitates both installation and maintenance work. You can also use the removable terminal block of the FR-F500 series, which is compatible to the FR-F700 series. However, please note that some of the functions of the FR-F700 series are not available when you use a terminal block from the FR-F500 series.

Replacement of the terminal block:



FR-F500 FR-F700



Specifications FR-F 740-00023 to -01160

Series			FR-F 740													
			00023	00038	00052	00083	00126	00170	00250	00310	00380	00470	00620	00770	00930	01160
Output	Rated motor capacity ① [kW]	120% overlaod capacity ⑤	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
		150% overlaod capacity	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
	Rated current [A] ⑥	120% overlaod capacity ⑤ I_{rated} ⑥	2.3 (2.0)	3.8 (3.2)	5.2 (4.4)	8.3 (7.1)	12.6 (10.7)	17 (14.5)	25 (21.3)	31 (26.4)	38 (32.3)	47 (40.0)	62 (52.7)	77 (65.5)	93 (79.1)	116 (98.6)
			$I_{max.\ 60\ s}$	2.5	4.2	5.7	9.1	13.9	18.7	27.5	34.1	41.8	51.7	68.2	84.7	102.3	127.5
			$I_{max.\ 3\ s}$	2.8	4.6	6.2	10	15.1	20.4	30	37.2	45.6	56.4	74.4	92.4	111.6	139.2
		150% overlaod capacity I_{rated} ⑥	2.1 (1.8)	3.5 (3.0)	4.8 (4.1)	7.6 (6.4)	11.5 (9.8)	16 (13)	23 (19)	29 (24)	35 (30)	43 (36)	57 (48)	70 (60)	85 (72)	106 (90)
			$I_{max.\ 60\ s}$	2.5	4.2	5.8	9.1	13.8	19.2	27.6	34.8	42	51.6	68.4	84	102	127.2
			$I_{max.\ 3\ s}$	3.1	5.2	7.2	11.4	17.2	24	34.5	43.5	52.5	64.5	85.5	105	127.5	159
	Output capacity [kVA]	120% overlaod capacity ⑤	1.8	2.9	4.0	6.3	9.6	13	19.1	23.6	29.0	35.8	47.3	58.7	70.9	88.4
		150% overlaod capacity	1.6	2.7	3.7	5.8	8.8	12.2	17.5	22.1	26.7	32.8	43.4	53.3	64.8	80.8
	Overload current rating ②	120% overlaod capacity	120% of rated motor capacity for 3s; 110% for 1 min. (max. ambient temperature 40°C) – typical for pumps and fans													
		150% overlaod capacity	150% of rated motor capacity for 3s; 120% for 1 min. (max. ambient temperature 50°C) – typical for conveyor belts and centrifuges													
	Voltage ③		3-phase AC, 0 V to power supply voltage													
	Frequency range		0.5–400 Hz													
	Control method		V/f control, optimum excitation control or simple magnetic flux vector control													
	Modulation control		Sine evaluated PWM, Soft PWM													
	Carrier frequency		0.7 kHz–14.5 kHz (user adjustable)													
Input	Power supply voltage		3-phase, 380–480 V AC, −15% / +10%													
	Voltage range		323–528 V AC at 50 / 60 Hz													
	Power supply frequency		50 / 60 Hz ±5%													
	Rated input capacity ④ [kVA]	120% overlaod capacity ⑤	2.8	5.0	6.1	10	13	19	22	31	37	45	57	73	88	110
		150% overlaod capacity	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	80	100
Others	Cooling		Self cooling			Fan cooling										
	Power loss [kW]	120% overlaod capacity ⑤	0.06	0.08	0.1	0.16	0.19	0.24	0.34	0.39	0.49	0.58	0.81	1.0	1.17	1.51
		150% overlaod capacity	0.05	0.08	0.09	0.14	0.18	0.22	0.31	0.35	0.44	0.52	0.71	0.93	1.03	1.32
	Frame size		C					D		E		F		G	H	
	Inverter weight [kg]		3.5	3.5	3.5	3.5	3.5	6.5	6.5	7.5	7.5	13	13	23	35	35
	Reactor weight [kg]		–	–	–	–	–	–	–	–	–	–	–	–	–	–
Order information ⑧		Order no.	156569	156570	156571	156572	156573	156594	156595	156596	156597	156598	156599	156600	156601	156602

① The performance figures at the rated motor capacity are based on a motor voltage of 400 V.

② The overload capacity in % is the ratio of the overload current to the inverter's rated current in the respective operating mode. For repeated duty cycles allow sufficient time for the inverter and the motor to cool below the temperature reached at 100% load. The waiting periods can be calculated using the r.m.s. current method ($I^2 \times t$), for which knowledge of the duty.

③ The maximum output voltage cannot exceed the power supply voltage. The output voltage can be varied over the entire power supply voltage range.

④ The rated input capacity varies depending on the impedance values on the power supply side of the inverter (including the cables and input reactor).

⑤ When the load curve with 120% overload capacity is selected the maximum permitted ambient temperature is 40°C.

⑥ When operating with carrier frequencies ≥ 3 kHz this value is reduced automatically as soon as the frequency inverter exceeds the rated output current shown in parentheses (= 85% load).

⑦ When the cable bushing for the optional expansion cards is broken out the unit has an IP 00 protection rating.

⑧ The suffix EC or E1 in the model designation identifies the CE versions of the frequency inverter (for the European Union). The inverter types FR-F740-02160 and above are all delivered in the E1 version as standard (PCBs with two coats of protective varnish). The EC version (varnished PCBs) is standard for types FR-F740 00023 through 01800. The other version as always available as an option.

Specifications FR-F 740-01800 to -12120

Series				FR-F 740														
				01800	02160	02600	03250	03610	04320	04810	05470	06100	06830	07700	08660	09620	10940	12120
Output	Rated motor capacity ① [kW]	120% overlaod capacity ⑤		90	110	132	160	185	220	250	280	315	355	400	450	500	560	630
		150% overlaod capacity		75	90	110	132	160	185	220	250	280	315	355	400	450	500	560
	Rated current [A] ⑥	120% overlaod capacity ⑤	I_{rated} ⑥	180 (153)	216 (184)	260 (221)	325 (276)	361 (307)	432 (367)	481 (409)	547 (465)	610 (518)	683 (581)	770 (654)	866 (736)	962 (818)	1094 (870)	1212 (1030)
			$I_{max.\ 60\ s}$	198	238	286	357	397	475	529	602	671	751	847	953	1058	1203	1333
			$I_{max.\ 3\ s}$	216	259	312	390	433	518	577	656	732	820	924	1039	1154	1313	1454
		150% overlaod capacity	I_{rated} ⑥	144 (122)	180 (153)	216 (184)	260 (221)	325 (276)	361 (307)	432 (367)	481 (409)	547 (465)	610 (518)	683 (581)	770 (654)	866 (736)	962 (818)	1094 (870)
			$I_{max.\ 60\ s}$	173	216	259	312	390	433	518	577	656	732	820	924	1039	1154	1313
			$I_{max.\ 3\ s}$	216	270	324	390	487	541	648	721	820	915	1024	1155	1299	1443	1641
	Output capacity [kVA]	120% overlaod capacity ⑤		137	165	198	248	275	329	367	417	465	521	587	660	733	834	924
		150% overlaod capacity		110	137	165	198	248	275	329	367	417	465	521	587	660	733	834
	Overload current rating ②	120% overlaod capacity		120% of rated motor capacity for 3s; 110% for 1 min. (max. ambient temperature 40°C) – typical for pumps and fans														
		150% overlaod capacity		150% of rated motor capacity for 3s; 120% for 1 min. (max. ambient temperature 50°C) – typical for conveyor belts and centrifuges														
	Voltage ③			3-phase AC, 0 V to power supply voltage														
	Frequency range			0.5–400 Hz														
	Control method			V/f control, optimum excitation control or simple magnetic flux vector control														
	Modulation control			Sine evaluated PWM, Soft PWM														
	Carrier frequency			0.7 kHz–6 kHz (user adjustable)														
Input	Power supply voltage			3-phase, 380–500 V AC, −15% / +10%														
	Voltage range			323–550 V AC at 50 / 60 Hz														
	Power supply frequency			50 / 60 Hz ±5%														
	Rated input capacity ④ [kVA]	120% overlaod capacity ⑤		137	165	198	248	275	329	367	417	465	520	587	660	733	834	924
		150% overlaod capacity		110	137	165	198	248	275	329	367	417	465	520	587	660	733	834
Others	Cooling			Fan cooling														
	Power loss [kW]	120% overlaod capacity ⑤		2.7	3.3	3.96	4.8	5.55	6.6	7.5	8.4	9.45	10.65	12.0	13.5	15.0	16.8	18.9
		150% overlaod capacity		2.25	2.7	3.3	3.96	4.8	5.55	6.6	7.5	8.4	9.45	10.65	12.0	13.5	15.0	16.8
	Frame size			H	J		K		L		M			N		P		
	Inverter weight [kg]			37	50	57	72	72	110	110	220	220	220	235	235	285	285	285
	Reactor weight [kg]			20	22	26	28	29	30	35	38	42	46	50	57	67	85	95
Order information ⑧			Order no.	158604	158605	158607	158608	158609	158610	158611	158612	158613	158614	158615	158616	158617	158619	158620

① The performance figures at the rated motor capacity are based on a motor voltage of 400 V.

② The overload capacity in % is the ratio of the overload current to the inverter's rated current in the respective operating mode. For repeated duty cycles allow sufficient time for the inverter and the motor to cool below the temperature reached at 100% load. The waiting periods can be calculated using the r.m.s. current method ($I^2 \times t$), for which knowledge of the duty.

③ The maximum output voltage cannot exceed the power supply voltage. The output voltage can be varied over the entire power supply voltage range.

④ The rated input capacity varies depending on the impedance values on the power supply side of the inverter (including the cables and input reactor).

⑤ When the load curve with 120% overload capacity is selected the maximum permitted ambient temperature is 40°C.

⑥ When operating with carrier frequencies ≥ 2.5 kHz this value is reduced automatically as soon as the frequency inverter exceeds the rated output current shown in parentheses (= 85% load).

⑦ When the cable bushing for the optional expansion cards is broken out the unit has an IP 00 protection rating.

⑧ The suffix EC or E1 in the model designation identifies the CE versions of the frequency inverter (for the European Union). The inverter types FR-F740-02160 and above are all delivered in the E1 version as standard (PCBs with two coats of protective varnish). The EC version (varnished PCBs) is standard for types FR-F740 00023 through 01800. The other version as always available as an option.

Specifications

FR-F 740			Description
Control specifications	Frequency setting resolution	Analog input	0.015 Hz / 0–50 Hz (terminal 2, 4: 0–10 V / 12 bit) 0.03 Hz / 0–50 Hz / (terminal 2, 4: 0–5 V / 11 bit, 0–20 mA / 11 bit, terminal 1: –10–+10 V / 11 bit) 0.06 Hz / 0–50 Hz (terminal 1: 0–±5 V / 10 bit)
		Digital input	0.01 Hz
	Frequency accuracy		±0.2% of the maximum output frequency (temperature range 25° ± 10°C) via analog input; ±0.01% of the set output frequency (via digital input)
	Voltage / frequency characteristics		Base frequency adjustable from 0 to 400 Hz; selection between constant torque, variable torque or optional flexible 5-point V/f characteristics
	Starting torque		120% (3 Hz) when set to simple magnetic flux vector control and slip compensation
	Acceleration / deceleration time		0; 0.1 to 3600 s (can be set individually)
	Acceleration / deceleration characteristics		Linear or S-form course, user selectable
	DC injection brake		Operating frequency (0–120 Hz), operating time (0–10 s) and operating voltage (0–30%) can be set individually. The DC brake can also be activated via the digital input.
	Stall prevention		Respones threshold 0–150%, user adjustable, also via analog input
	Motor protection		Electronic motor protection relay (rated current user adjustable)
Control signals for operation	Frequency setting values	Analog input	Terminal 2, 4: 0–5 V DC, 0–10 V DC, 0/4–20 mA Terminal 1: 0–±5 V DC, 0–±10 V DC
		Digital input	Operation panel or optional expansion board
	Start signal		Available individually for forward rotation and reverse rotation. Start signal automatic self-holding input (3-wire input) can be selected.
	Input signals		Any of 12 signals can be selected using parameters 178 to 189 (input terminal function selection): multi speed, second parameter function, terminal 4 input, JOG operation, automatic restart after instantaneous power failure, external thermal relay input, FR-HC connection (inverter operation enable signal) and FR-HC connection (instantaneous power failure detection), control panel operation/external interlock signal, PID control, control panel operation, control panel<->external operation, output stop, start self-holding, forward/reverse rotation command, inverter reset, PTC thermistor input, PID forward/reverse operation switchover, control panel<->NET, NET<->external operation, command source switchover
	Output signals	Operating state	Any of 7 signals can be selected using parameter 190 to 196 (output terminal function selection): Frequency control status, instantaneous power failure (under voltage), overload warning, output frequency detection, second output frequency detection, regenerative brake with pre-alarm (01800 and above), electronic thermal relay function with pre-alarm, control panel operation mode, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward rotation/reverse rotation, commercial power supply-inverter switchover, direct mains operation motor 1-4, frequency inverter operation motor 1-4, inverter running start command ON, deceleration at an instantaneous power failure, PID control activated, re-start, PID output suspension, life time alarm, alarm output 3 (OFF signal), power savings average value update timing, current average monitor, alarm output2, maintenance timer alarm, remote outputs, minor failure output, alarm output, traverse operation, open-collector outputs (5 outputs), relay outputs (2 outputs), alarm code outputs (4 bits via open-collector)
		When using the FR-A7AY option	In addition to the above operating modes parameters 313-319 (function selection for the additional 7 output terminals) can also be used to assign the following four signals: control circuit capacitor life, main circuit capacitor life, cooling fan life, inrush current limit circuit life
		Pulse/analog output	You can also use parameter 54 (assign analog current output) and 158 (assign analog voltage output) to assign the following displays to one or both outputs: output frequnecy, motor current (steady or peak), output voltage, frequency setting value, motor running speed, converter output voltage (steady or peak), electronic thermal relay function load factor, input voltage, output voltage, load meter, reference voltage output, motor load factor, energy saving effect, regenerative brake circuit duty (01800 and above), PID set point, PID process value
Display	Control unit display (FR-PU04/ FR-DU07)	Operating state	Output frequency, motor current (steady or peak value), output voltage, alarm indication, frequency setting, motor running speed, converter output voltage (steady or peak value), electronic thermal load factor, input power, output power, road meter, cumulative energization time, actual operation time, motor load factor, watt-hours meter, power saving effect, cumulative saving power, regenerative brake circuit duty (01800 and above), PID set point, PID process value, PID deviation monitor, I/O terminal monitor, optional input terminal monitor (FR-DU07 only), optional output terminal monitor (FR-DU07 only), option fitting state monitor (FR-PU04 only), terminal assignment state (FR-PU04 only)
		Alarm definition	Alarm definition is displayed when the protective function is activated, the output voltage/current/frequency/cumulative energization time right before the protection function was activated and the past 8 alarm definitions are stored.
		Interactive guidance	Operation guide/trouble shooting with a help function (FR-PU04 only)
Protection	Protective functions		Overcurrent cutoff (during acceleration, deceleration or at constant speed), overvoltage cutoff (during acceleration, deceleration or at constant speed), inverter protection thermal operation, motor protection thermal operation, heatsink overheat, instantaneous power failure occurence, under voltage, input phase failure, motor overload, output short circuit, ground fault overcurrent, output phase failure, external thermal relay operation, PTC thermistor operation, option alarm, parameter error, control unit disconnection, retry count excess, CPU alarm, power supply short for control panel, 24 V DC power output short, output current detection value over, inrush resitance overheat, communication error (frequency inverter), analog input alarm, internal circuit alarm (15 V DC power supply), fan fault, overcurrent stall prevention, overvoltage stall prevention, electronic thermal pre-alarm, control unit stop, maintenance timer alarm (FR-DU07 only), MT-BU5 external brake module overload (01800 and above), parameter write error, copy error, operation panel lock, parameter copy error
	Protection rating*		IP20 (FR-F 740-00023 to -00620); IP00 (FR-F 740-00770 to -12120)

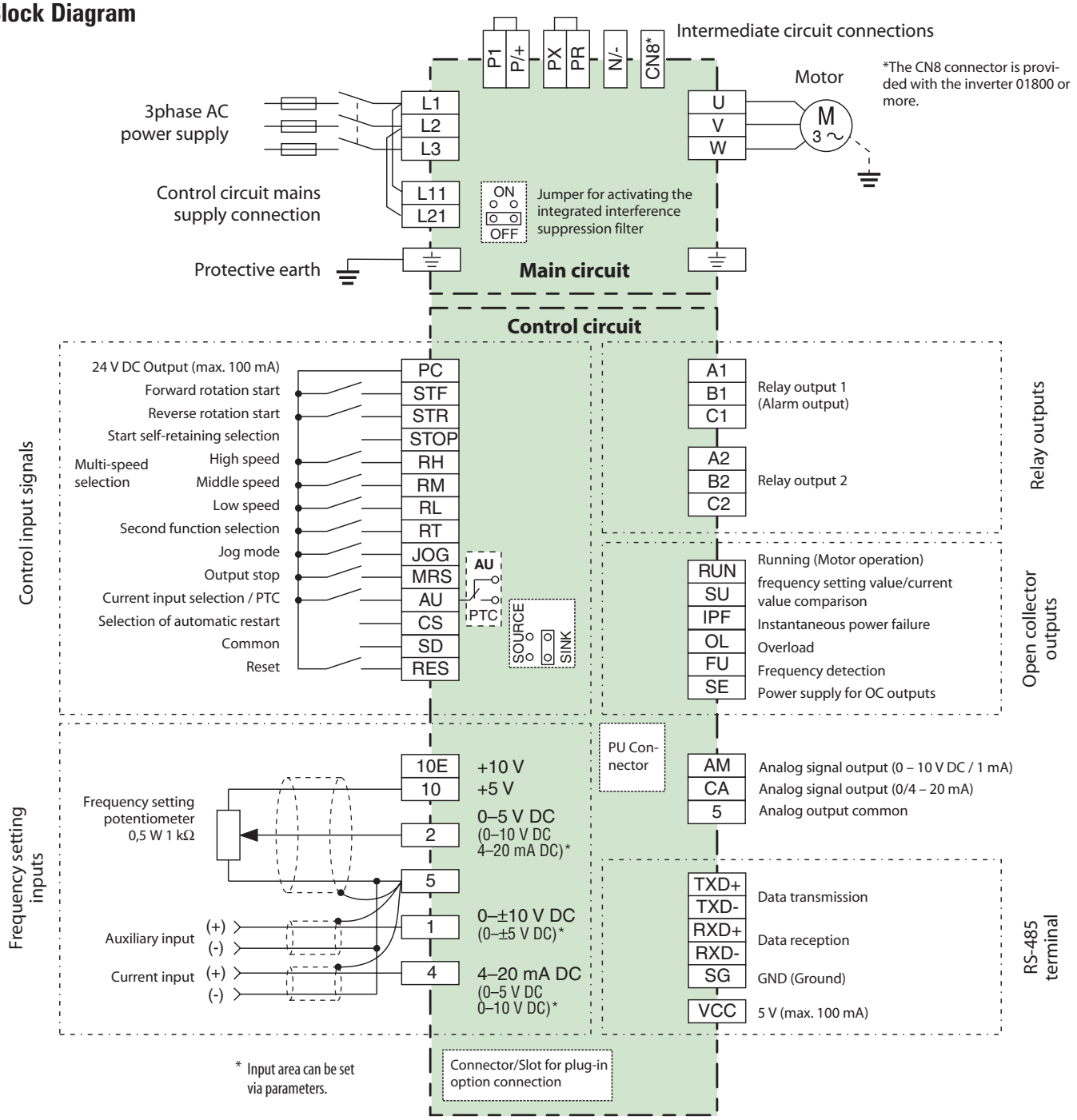
* FR-DU07: IP40 (does not apply for the PU connection)

General Operating Conditions

Item	Specifications
Ambient temperature in operation	−10°C to +50°C (non-freezing) For selection of the load characteristics with a 120% overload rating the max. temperature is 40°C.
Storage temperature*	−20 to +65°C
Ambient humidity	Max. 90% RH (non-condensing)
Altitude	Max. 1000 m above NN
Shock resistance	10 G (3 times each in 3 directions)
Vibration resistance	Max. 0.6 G
Ambience conditions	For indoor use only, avoid environments containing corrosive gases, install in a dust-free location.
Certifications	UL / CSA / CE / EN / Gost / CCC
Max. cable length	2 kHz: up to 300 m for 0023, other types up to 500 m < 5 kHz: up to 200 m for 0023, up to 300 m for 0038, other types up to 500 m 5–9 kHz: up to 100 m ≥10 kHz: up to 50 m

* The product may only be exposed to the full extremes of this temperature range for short periods (e.g. during transportation).

Block Diagram



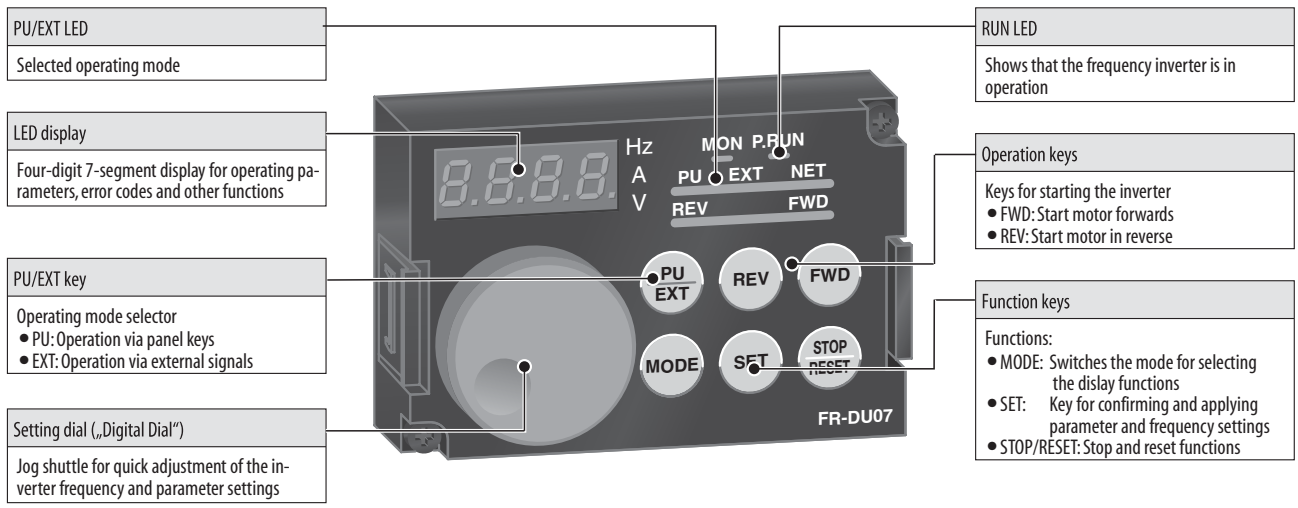
Terminal Assignment of Main Circuit Terminals

Function	Terminal	Designation	Description
Main circuit connection	L1, L2, L3	Mains supply connection	Mains power supply of the inverters (380–480 V AC, 50/60 Hz); (380-500 V – 01800 and above)
	P/+, N/–	External brake unit connection	An optional external brake resistor can be connected to the terminals P and N or you can connect a optional high power factor converter.
	P1, P/+	Converter choke coil connection	An optional choke coil can be connected to the terminals P1 and P/+. The jumper on terminals P1 and P/+ must be removed when this optional choke coil is used on frequency inverter models 01160 and below. The DC reactor supplied with the unit must be installed on frequency inverter models 01800 and above.
	PR, PX		Please do not remove or use terminals PR and PX or the jumper connected.
	U, V, W	Motor connection	Voltage output of the inverter (3-phase, 0 V up to power supply voltage, 0,5–400 Hz)
	L11, L21	Control circuit mains supply connection	To use external power for the control circuit connect the mains power to L11/L21 (and remove jumpers L1 and L2).
	CN8	Ext. brake transistor control	Control connection for the MT-BU5 external brake module
	⏚	PE	Protective earth connection of inverter

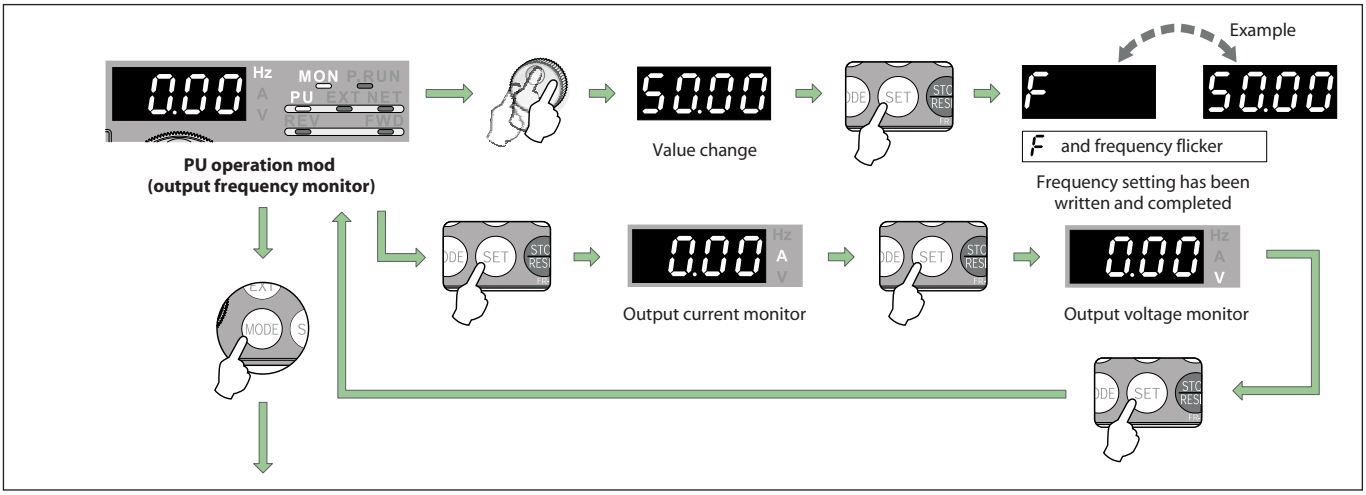
Terminal Assignment of Signal Terminals

Function	Terminal	Designation	Description
Control connection (programmable)	STF	Forward rotation start	The motor rotates forward, if a signal is applied to terminal STF.
	STR	Reverse rotation start	The motor rotates reverse, if a signal is applied to terminal STR.
	STOP	Start self-retaining selection	The start signals are self-retaining, if a signal is applied to terminal STOP.
	RH, RM, RL	Multi-speed selection	Preset of 15 different output frequencies
	JOG	Jog mode selection	The JOG mode is selected, if a signal is applied to terminal JOG (factory setting). The inverters FR-A 540L-G 375 k and 450 k are not equipped with a JOG terminal. The start signals STF and STR determine the rotation direction.
	RT	Second parameter settings	A second set of parameter settings is selected, if a signal is applied to terminal RT.
	MRS	Output stop	The inverter lock stops the output frequency without regard to the delay time. You can select a make or break signal for the controller inhibit function by changing parameter 17.
	RES	RESET input	An activated protective circuit is reset, if a signal is applied to the terminal RES (t > 0,1 s).
	AU	Current input selection	The 0/4–20mA signal on terminal 4 is enabled by a signal on the AU terminal.
		PTC input	If you connect a PTC temperature sensor you must assign the PTC signal to the AU terminal and set the slide switch on the control circuit board to the PTC position.
	CS	Automatic restart after instantaneous power failure	The inverter restarts automatically after a power failure, if a signal is applied to the terminal CS.
Common	SD	Reference potential (0V) for the PC terminal (24V)	When "sink" control logic is selected by setting the control signal jumper a specific control function is triggered when the corresponding control terminal is connected to the SD terminal. When "source" control logic is selected and you are using external 24V power you must connect the 0V of the external power supply to terminal SD. The SD terminal is isolated from the digital electronics with optocouplers.
	PC	24 V DC output	Internal power supply 24 V DC/0,1 A output
Setting value specification	10 E	Voltage output for potentiometer	Output voltage 10 V DC. Max. output current 10 mA. Recommended potentiometer: 1 kΩ, 2 W linear
	10		Output voltage 5 V DC. Max. output current 10 mA. Recommended potentiometer: 1 kΩ, 2 W linear
	2	Input for frequency setting value signal	The setting value 0–10 V or 0/4–20 mA is applied to this terminal. You can switch between voltage and current setpoint values with parameter 73. The input resistance is 10 kΩ.
	5	Reference point for frequency setting value signal	Terminal 5 is the reference point for all analog setting values and for the analog output signal AM and CA. The terminal is not isolated from the reference potential of the control circuit and **must not be earthed**.
	1	Auxiliary input for frequency setting value signal 0–±5 (10) V DC	An additional voltage setting value signal of 0–±5 (10) V DC can be applied to terminal 1. The voltage range is preset to 0–±10 V DC. The input resistance is 10 kΩ.
	4	Input for setting value signal	The setting value 0/4–20 mA or 0–10 V is applied to this terminal. You can switch between voltage and current setpoint values with parameter 73. The input resistance is 250 Ω. The current setting value is enabled via terminal function AU.
Signal output (programmable)	A1, B1, C1	Potential free Relay output 1 (Alarm)	The alarm is output via relay contacts. The block diagram shows the normal operation and voltage free status. If the protective function is activated, the relay picks up. The maximum contact load is 200 V AC / 0.3 A or 30 V DC / 0.3 A.
	A2, B2, C2	Potential free Relay output 2	Any of the available 42 output signals can be used as the output driver. The maximum contact load is 230 V AC / 0.3 A oder 30 V DC / 0.3 A.
	RUN	Signal output for motor operation	The output is switched low, if the inverter output frequency is equal to or higher than the starting frequency. The output is switched high, if no frequency is output or the DC brake is in operation.
	SU	Signal output for frequency setting value/current value comparison	The SU output supports a monitoring of frequency setting value and frequency current value. The output is switched low, once the frequency current value (output frequency of the inverter) approaches the frequency setting value (determined by the setting value signal) within a preset range of tolerance.
	IPF	Signal output for instantaneous power failure	The output is switched low for a temporary power failure within a range of 15 ms ≤ t_{IPF} ≤ 100 ms or for under voltage.
	OL	Signal output for overload alarm	The OL is switched low, if the output current of the inverter exceeds the current limit preset in parameter 22 and the stall prevention is activated. If the output current of the inverter falls below the current limit preset in parameter 22, the signal at the OL output is switched high.
	FU	Signal output for monitoring output frequency	The output is switched low once the output frequency exceeds a value preset in parameter 42 (or 43). Otherwise the FU output is switched high.
	SE	Reference potential for signal outputs	The potential that is switched via open collector outputs RUN, SU, OL, IPF and FU is connected to this terminal.
	CA	Current output 0–20 mA	One of 18 monitoring functions can be selected, e.g. external frequency output. CA and AM output can be used simultaneously. The functions are determined by parameters. An amperemeter can be connected (measuring range: 0–20 mA).
	AM	Analog output 0–10 V (1 mA)	One of 18 monitoring functions can be selected, e.g. external frequency output. CA and AM output can be used simultaneously. The functions are determined by parameters. A DC voltmeter can be connected. The max. output voltage is 10 V.
Interface	—	Connection of control panel (via RS485 terminal)	Communications via RS485 I/O standard: RS485, Multi-Drop operation, 4,800 – 38,400 Baud (overall length: 500 m)
	—	RS484 terminal (via RS485 terminal)	Communications via RS485 I/O standard: RS485, Multi-Drop operation, 300 – 38,400 Baud (overall length: 500 m)

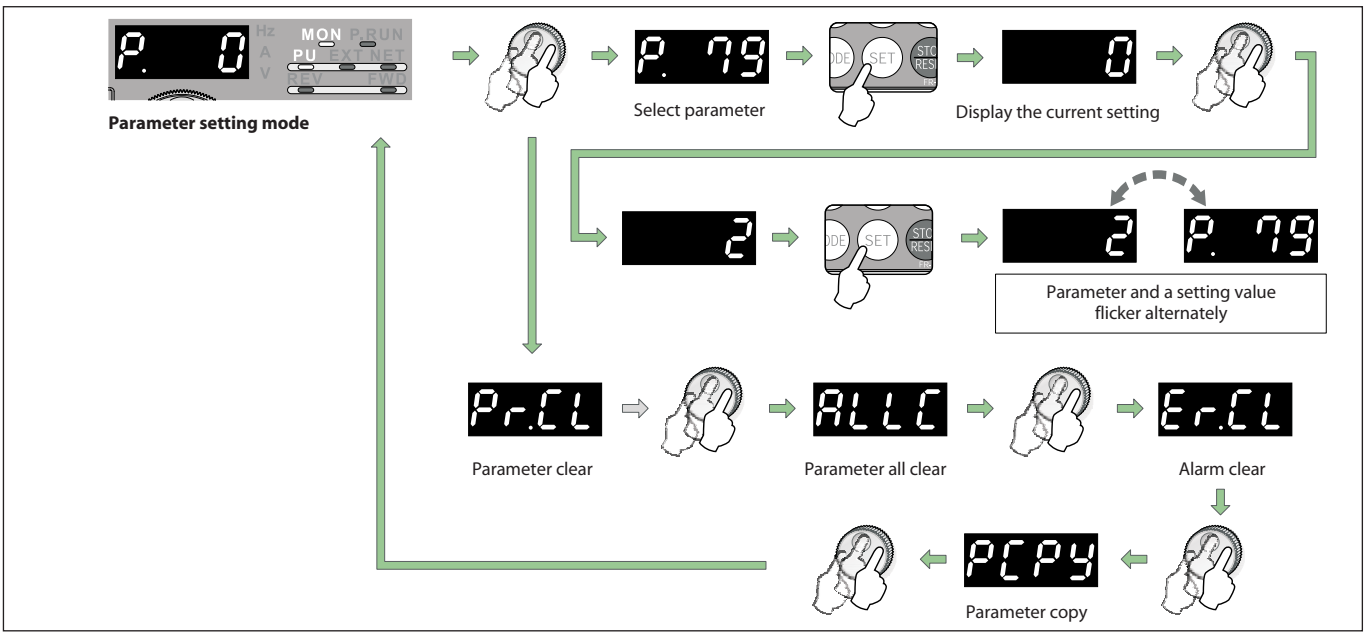
Built-in Operation Panel FR-DU07 (Standard)



Setting monitoring and frequency



Setting parameters



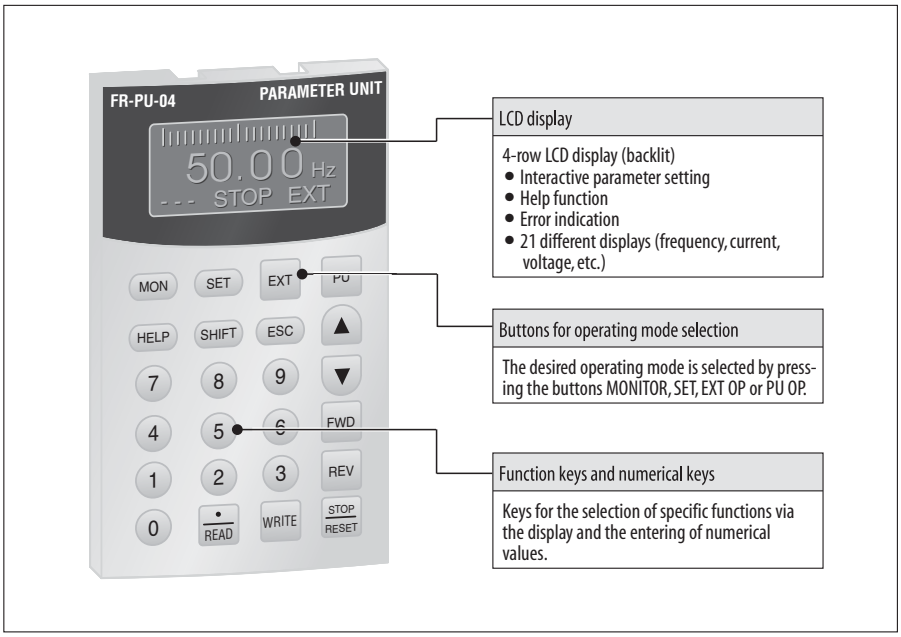
Control Panel FR-PU04 (Option)

The control panel FR-PU04 with extended functions is available as optional accessory. This control panel provides a 10-key keypad for a direct entering of numerical values. A 4-row LC display returns operational data, parameter names or status and error messages in uncoded text. The control panel displays text in the following selectable languages: English, German, French, Spanish, Swedish, Italian, Finnish, and Japanese.

In addition to the functions* of the standard control panel the FR-PU04 displays and monitors 21 different values and states in total.

The control unit FR-PU04 is used instead of the standard control unit FR-DU04 and can be replaced by this after use.

* The parameter copy function and the parameter and alarm display functions are restricted when the panel is connected to the FR-F 740.



Menu Guide to the Control Panel FR-PU04

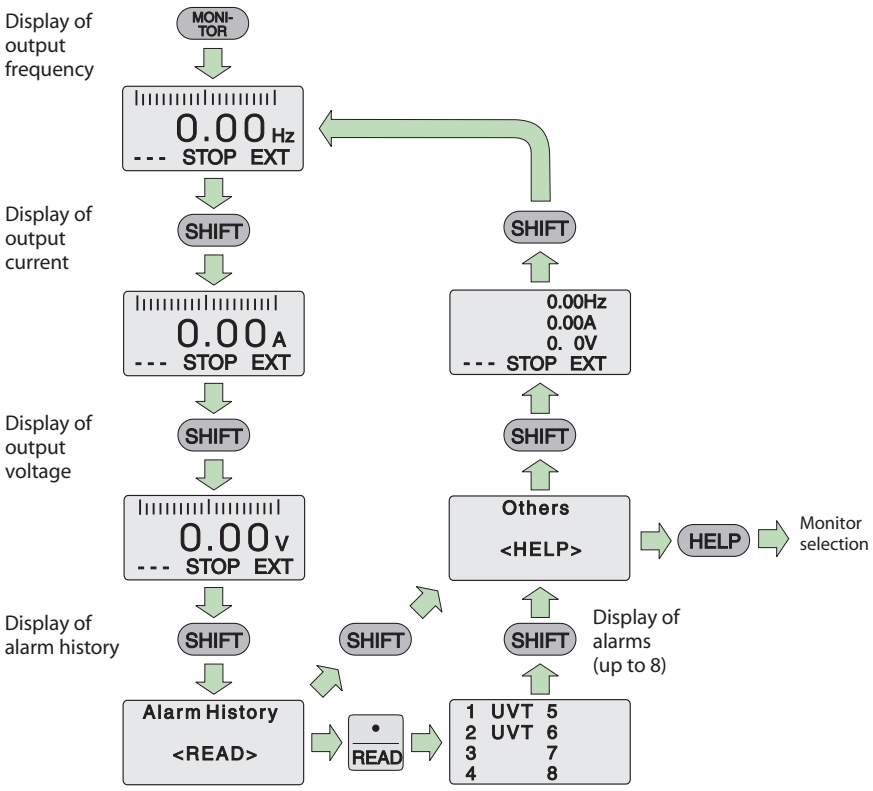
Displaying the parameter list

Press the SET key to enter the parameter setting menu. Then press the HELP key to display the parameter lists. After pressing the READ key, the according parameter value will be read in.

Copying parameters

Press the SET key and then the ▲ key to enter the copy mode. Now you find three choices:

- Press the READ key to read out all parameters from the inverter.
- Press the WRITE key to write parameters to the inverter.
- Press the ▼ key to verify the values stored in the control panel and the inverter.

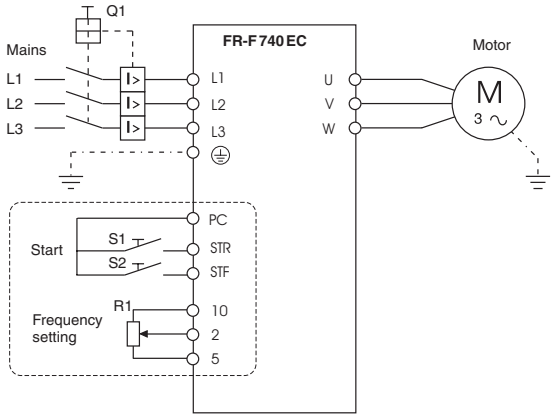


Operating Modes

The inverter can alternatively be operated via external signals or directly via the operation panel FR-DU07 or the control panels FR-PU04.

On the FR-DU07 control panel the operating mode is selected by pressing the PU/EXT key. On the FR-PU04 the EXT key selects operation by external signals and the PU key selects operation via the control panel.

Sample connection



These connections are required for combined operation or operation by external signals.

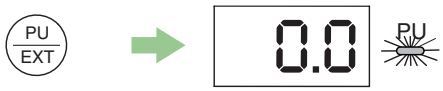
Operation from the control panel

The direction of rotation and frequency setting of the inverter are controlled from the built-in operation panel.

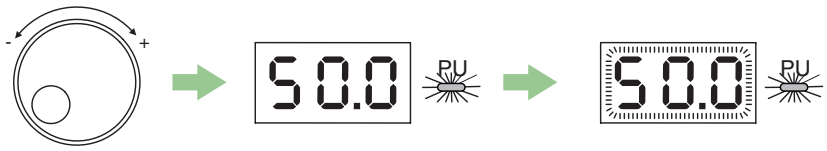
The setting of the output frequency is increased or decreased via the Digital Dial.

The example below shows the operational steps for a frequency setting with following motor start and motor stop.

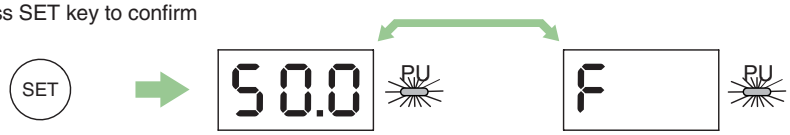
① Press the PU/EXT key



② Set frequency with Digital Dial

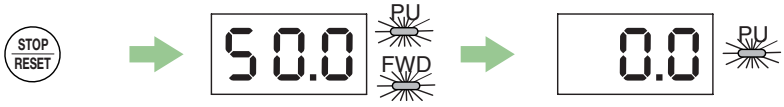


③ Press SET key to confirm



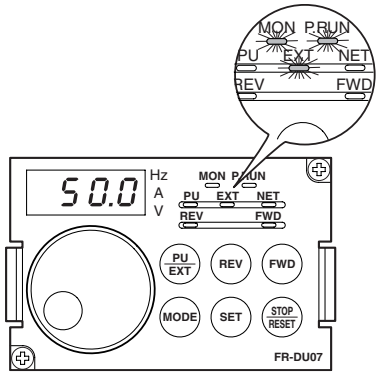
④ Press FWD to start the motor

⑤ Stop motor



Operation by external signals

The direction of rotation and frequency setting of the inverter are controlled by external signals. The following figure shows the display on the built-in operation panel FR-DU07 for forward rotation of the motor and a frequency of 50 Hz.



Combined operation

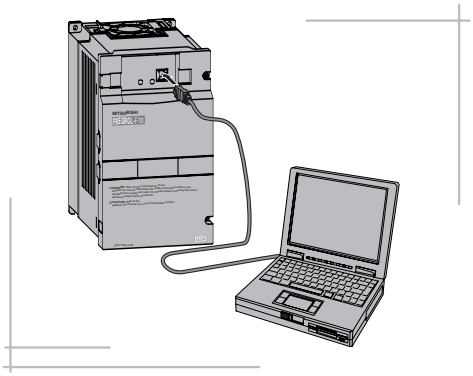
In addition to the operation by external signals and the operation from the control panel (built-in or external) the inverter can be operated in combined operation mode.

- Setting value preset from the control panel and external starting signal.
- External setting value signal and starting signal from the control panel.

VFD Setup Software

The VFD Setup Software is a powerful tool for the operation of your frequency inverter. The software (version 2.4) is MS Windows 95/98/ME/XP and NT/2000 compatible, and therefore allows the inverter operation via any conventional personal computer. Several frequency inverters can be set up, operated, and monitored simultaneously across a network or via a personal computer or notebook. The software is designed for all frequency inverters of the MITSUBISHI FR-S 500, FR-E 500, FR-A 500, FR-F 500 and FR-F 700* series.

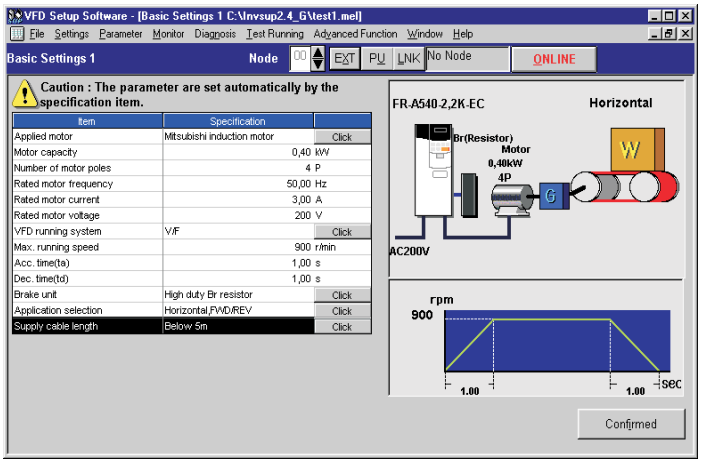
The connection between personal computer and inverter is established either via an RS485 network or directly via an SC-FR PC adapter cable available separately.



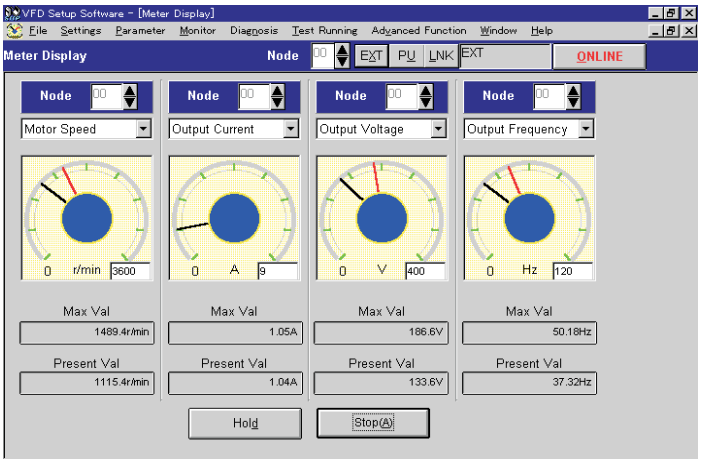
Benefits

- System settings
  Due to the network capabilities of the inverter up to 32 frequency inverters can be operated simultaneously.
- Parameter settings
  By means of overall and function related overviews different parameters can be adjusted easily.
- Display functions
  The comprehensible display functions enable data, analog, oscillograph, and alarm displays.
- Diagnostis
  The analysis of the inverter status provides a thorough error correction.
- Test operation
  The test operation provides a simulation of the operation and adjustment via the auto-tuning function.
- File management
  Parameters can be saved on the personal computer and printed out.
- Help
  The extensive online help provides support concerning all questions regarding settings and operation.

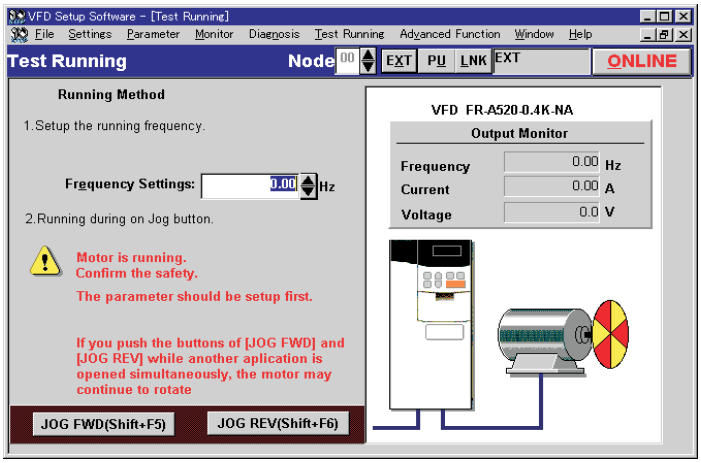
Parameter setting



Display and monitor



Test operation



* The FR-F700 is supported by Version 3.1 and above (available from January 2005)

Parameter Overview

Function	Parameter	Meaning	Setting range	Default setting
Basic parameters	0	Torque boost	0–30%	6 / 4 / 3 / 2 / 1.5 / 1% ②
	1	Maximum frequency	0–120 Hz	120 / 60 Hz ②
	2	Minimum frequency	0–120 Hz	0 Hz
	3	Base frequency	0–400 Hz	50 Hz
	4	1. Multi-speed setting (high speed) ①	0–400 Hz	50 Hz
	5	2. Multi-speed setting (middle speed) ①	0–400 Hz	30 Hz
	6	3. Multi-speed setting (low speed) ①	0–400 Hz	10 Hz
	7	Acceleration time	0–360 s / 0–3600 s	5 s / 15 s ②
	8	Deceleration time	0–360 s / 0–3600 s	10 s / 30 s ②
	9	Electronic thermal O/L relay	0–500 A / 0–3600 A ②	Rated current
Parameters for standard drive operation	10	DC injection brake operation frequency	0–120 Hz / 9999	3 Hz
	11	DC injection brake operation time	0–10 s / 8888	0.5 s
	12	DC injection brake operation voltage	0–30%	4 / 2 / 1% ②
	13	Starting frequency	0–60 Hz	0.5 Hz
	14	Load pattern selection	0 / 1	1
	15	JOG frequency	0–400 Hz	5 Hz
	16	JOG acceleration/deceleration time	0–360 s / 0–3600 s	0.5 s
	17	MRS input selection	0, 2	0
	18	High speed maximum frequency	120–400 Hz	120 / 60 Hz ②
	19	Base frequency voltage	0–1000 V / 8888 / 9999	8888
	20	Acceleration/deceleration reference frequency	1–400 Hz	50 Hz
	21	Acceleration/deceleration time increments	0 / 1	0
	22	Stall prevention operation level ①	0–150% / 9999 / 0–120% / 9999 ②	120% / 110% ②
	23	Stall prevention operation level compensation factor at double speed	0–150% / 9999/ 0–120% / 9999 ②	9999
	24	Multi-speed setting (speed 4) ①	0–400 Hz / 9999	9999
	25	Multi-speed setting (speed 5) ①	0–400 Hz / 9999	9999
	26	Multi-speed setting (speed 6) ①	0–400 Hz / 9999	9999
	27	Multi-speed setting (speed 7) ①	0–400 Hz / 9999	9999
	28	Multi-speed input compensation selection	0 / 1	0
	29	Acceleration/deceleration pattern selection	0 / 1 / 2 / 3	0
	30	Regenerative function selection	0 / 2 / 0 / 1 / 2 ②	0
	31	Frequency jump 1A	0–400 Hz / 9999	9999
	32	Frequency jump 1B	0–400 Hz / 9999	9999
	33	Frequency jump 2A	0–400 Hz / 9999	9999
	34	Frequency jump 2B	0–400 Hz / 9999	9999
	35	Frequency jump 3A	0–400 Hz / 9999	9999
	36	Frequency jump 3B	0–400 Hz / 9999	9999
	37	Speed display	0 / 1–9998	0
Settings of control outputs	41	Up-to-frequency sensitivity	0–100%	10%
	42	Output frequency detection	0–400 Hz	6 Hz
	43	Output frequency detection for reverse rotation	0–400 Hz / 9999	9999
2nd parameter settings	44	2nd Acceleration/deceleration time	0–360 s / 0–3600 s	5 s
	45	2nd Deceleration time	0–360 s / 0–3600 s / 9999	9999
	46	2nd Torque boost	0–30% / 9999	9999
	47	2nd V/f characteristics (base frequency)	0–400 Hz / 9999	9999
	48	2nd Stall prevention operation current	0–150% / 0–120% ②	120% / 110% ②
	49	2nd Stall prevention operation frequency	0–400 Hz / 9999	0 Hz
	50	2nd Output frequency detection	0–400 Hz	30 Hz
	51	2nd Electronic thermal O/L relay	0–500 A / 9999 / 0–3600 A / 9999 ②	9999

Function	Parameter	Meaning	Setting range	Default setting
Display functions	52	DU/PU main display data selection ①	0 / 5 / 6 / 8–14 / 17 / 20 / 23 / 24 / 25 / 50–57 / 100 ③	0
	54	CA terminal function selection ①	1–3 / 5 / 6 / 8–14 / 17 / 21 / 24 / 50 / 52 / 53 ③	1
	55	Frequency monitoring reference ①	0–400 Hz	50 Hz
	56	Current monitoring reference ①	0–500 A / 0–3600 A ②	Rated current
Restart	57	Restart coasting time	0 / 0.1–5 s / 9999 / 0 / 0.1–30 s / 9999	9999
	58	Restart cushion time	0–60 s	1 s
Aux. functions	59	Remote function selection	0 / 1 / 2 / 3	0
Operation settings	60	Energy saving control selection	0 / 4 / 9	0
	65	Retry selection	0–5	0
	66	Stall prevention operation reduction starting frequency	0–400 Hz	50 Hz
	67	Number of retries at alarm occurrence	0–10 / 101–110	0
	68	Retry waiting time	0–10 s	1 s
	69	Retry count display erase	0	0
	70	Special regenerative brake duty ④	0–10%	0%
	71	Applied motor	0 / 1 / 2 / 20	0
	72	PWM frequency selection ①	0–15 / 0–6 / 25 ②	2
	73	Analog input selection	0–7 / 10–17	1
	74	Input filter time constant	0–8	1
	75	Reset selection/disconnected PU detection/PU stop selection ①	0–3 / 14–17 / 100–103 / 114–117 ⑤	14
	76	Alarm code output selection	0 / 1 / 2	0
	77	Parameter write selection ①	0 / 1 / 2	0
	78	Reverse rotation prevention selection	0 / 1 / 2	0
	79	Operation mode selection	0–4 / 6 / 7	0
Simple magnetic flux vector control	80	Motor capacity (simple magnetic flux vector control)	0.4–55 kW / 9999 / 0–3600 kW / 9999 ②	9999
	90	Motor constant (R1)	0.4–50 Ω / 9999 / 0–400 mΩ / 9999 ②	9999
Multi-speed setting	100	V/f1 (1st frequency)	0–400 Hz / 9999	9999
	101	V/f1 (1st frequency voltage)	0–1000 V	0
	102	V/f2 (2nd frequency)	0–400 Hz / 9999	9999
	103	V/f2 (2nd frequency voltage)	0–1000 V	0
	104	V/f3 (3rd frequency)	0–400 Hz / 9999	9999
	105	V/f3 (3rd frequency voltage)	0–1000 V	0
	106	V/f4 (4th frequency)	0–400 Hz / 9999	9999
	107	V/f4 (4th frequency voltage)	0–1000 V	0
	108	V/f5 (5th frequency)	0–400 Hz / 9999	9999
	109	V/f5 (5th frequency voltage)	0–1000 V	0
Communication functions	117	PU communication station	0–31	0
	118	PU communication speed	48 / 96 / 192 / 384	192
	119	PU communication stop bit length	0 / 1 data length 8; 10 / 11 data lengthe 7	1
	120	PU communication parity check	0 / 1 / 2	2
	121	Number of PU communication retries	0–10 / 9999	1
	122	PU communication check time interval	0–999.8 s / 9999	9999
	123	PU communication waiting time setting	0–150 ms / 9999	9999
	124	PU communication CR/LF presence/absence selection	0 / 1 / 2	1
	125	Terminal 2 frequency setting gain frequency	0–400 Hz	50 Hz
	126	Terminal 4 frequency setting gain frequency	0–400 Hz	50 Hz
PID control	127	PID control automatic switchover frequency	0–400 Hz / 9999	9999
	128	PID action selection	10 / 11 / 20 / 21 / 50 / 51 / 60 / 61	10
	129	PID proportional band ①	0.1–1000% / 9999	100%

Function	Parameter	Meaning	Setting range	Default setting
PID control	130	PID integral time ①	0.1–3600 s / 9999	1 s
	131	PID upper limit	0–100% / 9999	9999
	132	PID lower limit	0–100% / 9999	9999
	133	PID action set point ①	0–100%	0%
	134	PID differential time ①	0.01–10.00 s / 9999	9999
Commercial power supply switch-over	135	Power-supply switchover sequence output terminal selection	0 / 1	0
	136	MC switchover interlock time	0–100 s	1 s
	137	Waiting time at a start	0–100 s	0.5 s
	138	Commercial power-supply operation switchover selection at an alarm	0 / 1	0
	139	Automatic switchover frequency between inverter and commercial power-supply operation	0–60 Hz / 9999	9999
Backlash	140	Backlash acceleration stopping frequency	0–400 Hz	1 Hz
	141	Backlash acceleration stopping time	0–360 s	0.5 s
	142	Backlash deceleration stopping frequency	0–400 Hz	1 Hz
	143	Backlash deceleration stopping time	0–360 s	0.5 s
Display	144	Speed setting switchover	0 / 2 / 4 / 6 / 8 / 10 / 102 / 104 / 106 / 108 / 110	4
	145	PU display language selection	0–7	1
Variable current limiting	148	Stall prevention level at 0 V input	0–120%	110%
	149	Stall prevention level at 10 V input	0–120%	120%
Output current detection	150	Output current detection level	0–120%	110%
	151	Output current detection signal delay time	0–10 s	0 s
	152	Zero current detection level	0–200%	5%
	153	Zero current detection time	0–1 s	0,5 s
Help functions	154	Voltage reduction selection during stall prevention operation	0 / 1	1
	155	RT signal reflection time selection	0 / 10	0
	156	Stall prevention operation selection	0–31 / 100 / 101	0
	157	OL signal output timer	0–25 s / 9999	0
	158	AM terminal function selection ①	1–3 / 5 / 6 / 8–14 / 17 / 21 / 24 / 50 / 52 / 53 ③	1
	159	Automatic switchover ON range between commercial power-supply and inverter operation	0–10 Hz / 9999	9999
Aux. function	160	User group read selection ①	0 / 1 / 9999	9999
	161	Frequency setting/key lock operation selection	0 / 1 / 10 / 11	0
Restart	162	Automatic restart after instantaneous power failure selection	0 / 1 / 10 / 11	0
	163	First cushion time for restart	0–20 s	0 s
	164	First cushion voltage for restart	0–100%	0%
	165	Stall prevention operation level for restart	0–120%	110%
Output current detection	166	Output current detection signal retention time	0–10 s / 9999	0.1 s
	167	Output current detection operation selection	0 / 1	0
Aux. functions	168	Parameter for manufacturer setting. Do not make setting!	—	—
	169		—	—
Cumulative monitor clear	170	Cumulative power meter clear	0 / 10 / 9999	9999
	171	Operation hour meter clear	0 / 9999	9999
User functions	172	User group registered display/batch clear	9999 (0–16)	0
	173	User group registration	0–999 / 9999	9999
	174	User group clear	0–999 / 9999	9999
Terminal functions selection	178	STF terminal function selection	0–8 / 10–12 / 14 / 16 / 24 / 25 / 37 / 60 / 62 / 64–67 / 9999	60
	179	STR terminal function selection	0–8 / 10–12 / 14 / 16 / 24 / 25/ 37 / 61 / 62 / 64–67 / 9999	61
Terminal functions selection	180	RL terminal function selection	0–8 / 10–14 / 16 / 24 / 25 / 37 / 62 / 64–67 / 9999	0
	181	RM terminal function selection		1
	182	RH terminal function selection		2
	183	RT terminal function selection		3

Function	Parameter	Meaning	Setting range	Default setting
Terminal functions selection	184	AU terminal function selection	0–8 / 10–14 / 16 / 24 / 25 / 37 / 62–67 / 9999	4
	185	JOG terminal function selection	0–8 / 10–14 / 16 / 24 / 25 / 37 / 62 / 64–67 / 9999	5
	186	CS terminal function selection		6
	187	MRS terminal function selection		24
	188	STOP terminal function selection		25
	189	RES terminal function selection		62
	190	RUN terminal function selection	0–5 / 7 / 8 / 10–19 / 25 / 26 / 45–47 / 64 / 70–78 / 90–96 / 98 / 99 / 100–105 / 107 / 108 / 110–116 / 125 / 126 / 145–147 / 164 / 170 / 190–196 / 198 / 199 / 9999 ⑥	0
	191	SU terminal function selection		1
	192	IPF terminal function selection		2
	193	OL terminal function selection		3
	194	FU terminal function selection		4
	195	ABC1 terminal function selection	0–5 / 7 / 8 / 10–19 / 25 / 26 / 45–47 / 64 / 70–78 / 90 / 91 / 94–96 / 98 / 99 / 100–105 / 107 / 108 / 110–116 / 125 / 126 / 145–147 / 164 / 170 / 190 / 191 / 194–196 / 198 / 199 / 9999 ⑥	99
	196	ABC2 terminal function selection		9999
Multi-speed setting	232	Multi-speed setting (speed 8) ①	0–400 Hz / 9999	9999
	233	Multi-speed setting (speed 9) ①	0–400 Hz / 9999	9999
	234	Multi-speed setting (speed 10) ①	0–400 Hz / 9999	9999
	235	Multi-speed setting (speed 11) ①	0–400 Hz / 9999	9999
	236	Multi-speed setting (speed 12) ①	0–400 Hz / 9999	9999
	237	Multi-speed setting (speed 13) ①	0–400 Hz / 9999	9999
	238	Multi-speed setting (speed 14) ①	0–400 Hz / 9999	9999
	239	Multi-speed setting (speed 15) ①	0–400 Hz / 9999	9999
Help functions	240	Soft-PWM operation selection ①	0 / 1	1
	241	Analog input display unit switchover ①	0 / 1	0
	242	Terminal 1 added compensation amount (terminal 2)	0–100%	100%
	243	Terminal 1 added compensation amount (terminal 4)	0–100%	75%
	244	Cooling fan operation selection	0 / 1	0
Slip compensation	245	Rated slip	0–50% / 9999	9999
	246	Slip compensation time constant	0,01–10 s	0.5 s
	247	Constant-output region slip compensation selection	0 / 9999	9999
Aux. functions	250	Stop selection	0–100 s / 1000–1100 s / 8888 / 9999	9999
	251	Output phase failure protection selection	0 / 1	1
	252	Override bias	0–200%	50%
	253	Override gain	0–200%	150%
Life check	255	Life alarm status display	(0–15)	0
	256	Inrush current suppression circuit life display	(0–100%)	100%
	257	Control circuit capacitor life display	(0–100%)	100%
	258	Main circuit capacitor life display	(0–100%)	100%
	259	Main circuit capacitor life measuring	0 / 1	0
Special functions	260	PWM frequency automatic switchover	0 / 1	1
Power failure stop	261	Power failure stop selection	0 / 1 / 2	0
	262	Subtracted frequency at deceleration start	0–20 Hz	3 Hz
	263	Subtraction starting frequency	0–120 Hz / 9999	50 Hz
	264	Power-failure deceleration time 1	0–360 s / 0–3600 s	5 s
	265	Power-failure deceleration time 2	0–360 s / 0–3600 s / 9999	9999
	266	Power failure deceleration time switchover frequency	0–400 Hz	50 Hz
Other functions	267	Terminal 4 input selection	0 / 1 / 2	0
	268	Monitor decimal digits selection ①	0 / 1 / 9999	9999
	269	Parameter for manufacturer setting. Do not make setting!	—	—
Communication functions	331	RS-485 communication station	0–31 (0–247)	0

Function	Parameter	Meaning	Setting range	Default setting
Communication functions	332	RS-485 communication speed	3 / 6 / 12 / 24 / 48 / 96 / 192 / 384	96
	333	RS-485 communication stop bit length	0 / 1 / 10 / 11	1
	334	RS-485 communication parity check selection	0 / 1 / 2	2
	335	RS-485 communication number of retries	0–10 / 9999	1
	336	RS-485 communication check time interval	0–999.8 s / 9999	0
	337	RS-485 communication waiting time setting	0–150 ms / 9999	9999
	338	Communication operation command source	0 / 1	0
	339	Communication speed command source	0 / 1	0
	340	Communication startup mode selection	0 / 1 / 2 / 10 / 12	0
	341	RS-485 communication CR/LF selection	0 / 1 / 2	1
Aux. functions	342	Communication E^2PROM write selection	0 / 1	0
	343	Communication error count	—	0
Remote outputs	495	Remote output selection	0 / 1	0
	496	Remote output data 1 ①	0–4095	0
	497	Remote output data 2 ①	0–4095	0
Maintenance functions	503	Maintenance timer	0 (1–9998)	0
	504	Maintenance timer alarm output set time	0–9998 / 9999	9999
Communication functions	549	Protocol selection	0 / 1	0
	550	NET mode operation command source selection	0 / 1 / 9999	9999
	551	PU mode operation command source selection	1 / 2	2
Current average monitor	555	Current average time ①	0.1–1.0 s	1 s
	556	Data output mask time ①	00,0–20,0 s	0 s
	557	Current average value monitor signal output reference current ①	0–500 A / 0–3600 A ②	Rated inverter current
	563	Energization time carrying-over times	(0–65535)	0
	564	Operating time carrying-over times	(0–65535)	0
Aux. functions	570	Multiple rating setting	0 / 1	1
	571	Holding time at a start	0.0–10.0 s / 9999	9999
	573	4 mA Input check selection	1 / 9999	9999
PID Sleep function	575	Output interruption detection time	0–3600 s / 9999	1 s
	576	Output interruption detection level	0–400 Hz	0 Hz
	577	Output interruption release level	900–1100%	1000%
Advanced PID control	578	Auxiliary motor operation selection	0 / 1 / 2 / 3	0
	579	Motor switchover selection	0 / 1 / 2 / 3	0
	580	MC switching interlock time	0–100 s	1 s
	581	Start waiting time	0–100 s	1 s
	582	Auxiliary motor connection-time deceleration time	0–3600 s	1 s
	583	Auxiliary motor disconnection-time acceleration time	0–3600 s / 9999	1 s
	584	Auxiliary motor 1 starting frequency	0–400 Hz	50 Hz
	585	Auxiliary motor 2 starting frequency	0–400 Hz	50 Hz
	586	Auxiliary motor 3 starting frequency	0–400 Hz	50 Hz
	587	Auxiliary motor 1 stopping frequency	0–400 Hz	0 Hz
	588	Auxiliary motor 2 stopping frequency	0–400 Hz	0 Hz
	589	Auxiliary motor 3 stopping frequency	0–400 Hz	0 Hz
	590	Auxiliary motor start detection time	0–3600 s	5 s
	591	Auxiliary motor stop detection time	0–3600 s	5 s
Traverse function	592	Traverse function selection	0 / 1 / 2	0
	593	Maximum amplitude amount	0–25%	10%
	594	Amplitude compensation amount during deceleration	0–50%	10%
	595	Amplitude compensation amount during acceleration	0–50%	10%
	596	Amplitude acceleration time	0.1–3600 s	5 s
	597	Amplitude deceleration time	0.1–3600 s	5 s

Function	Parameter	Meaning	Setting range	Default setting
	611	Acceleration time at a restart	0–3600 s / 9999	5 s / 15 s ②
	867	AM output filter	0–5 s	0.01 s
	869	Current output filter	0–5 s	0,02 s
	872	Input phase failure protection selection	0 / 1	0
Regeneration avoidance function	882	Regeneration avoidance operation selection	0 / 1	0
	883	Regeneration avoidance operation level	300–800 V	760 V DC
	884	Regeneration avoidance at deceleration detection sensitivity	0–5	0
	885	Regeneration avoidance compensation frequency limit value	0–10 Hz / 9999	6 Hz
	886	Regeneration avoidance voltage gain	0–200%	100%
Free parameter	888	Free parameter 1 ①	0–9999	9999
	889	Free parameter 2 ①	0–9999	9999
Energy saving monitor	891	Cumulative power monitor digit shifted times ①	0–4 / 9999	9999
	892	Load factor ①	30–150%	100%
	893	Energy saving monitor reference (motor capacity) ①	0.1–55 kW / 0–3600 kW ②	Motor capacity at 120% / 150% overload capacity
	894	Control selection during commercial power-supply operation ①	0 / 1 / 2 / 3	0
	895	Power saving rate reference value ①	0 / 1 / 9999	9999
	896	Power unit cost ①	0–500 / 9999	9999
	897	Power saving monitor average time ①	0 / 1–1000 h / 9999	9999
	898	Power saving cumulative monitor clear ①	0 / 1 / 10 / 9999	9999
	899	Operation time rate (estimated value) ①	0–100% / 9999	9999
Calibration function	C0 (900)	CA terminal calibration ①	Calibration range	—
	C1 (901)	AM terminal calibration ①	Calibration range	—
	C2 (902)	Terminal 2 frequency setting bias frequency	0–400 Hz	0 Hz
	C3 (902)	Terminal 2 frequency setting bias	0–300%	0%
	125 (903)	Terminal 2 frequency setting gain frequency	0–400 Hz	0 Hz
	C4 (903)	Terminal 2 frequency setting gain	0–300%	100%
	C5 (904)	Terminal 4 frequency setting bias frequency	0–400 Hz	0 Hz
	C6 (904)	Terminal 4 frequency setting bias	0–300%	20%
	126 (905)	Terminal 4 frequency setting gain frequency	0–400 Hz	50 Hz
	C7 (905)	Terminal 4 frequency setting gain	0–300%	100%
Analog current output calibration function	C8 (930)	Current output bias signal	0–100%	0%
	C9 (930)	Current output bias current	0–100%	0%
	C10 (931)	Current output gain signal	0–100%	100%
	C11 (931)	Current output gain current	0–100%	100%
	989	Parameter copy alarm release	10 / 100 ②	10 / 100 ②
Help functions	990	PU buzzer control ①	0 / 1	1
	991	PU contrast adjustment ①	0–63	58
	PR.CL	Parameter clear	0 / 1	0
	ALLC	All parameter clear	0 / 1	0
	Er.CL	Alarm history clear	0 / 1	0
	PCPY	Parameter copy	0 / 1 / 2 / 3	0

Notes:

① These parameters can be changed during operation if parameter 77 is set to 0 (factory setting).

② The possible setting values depend on the capacity class of the inverter.

③ A setting of 9 is possible on models 01800 and above.

④ This setting is possible on models 01800 and above.

⑤ Setting of 100 to 103, 114 to 117 are possible on models 01800 and above.

⑥ Setting of 7 and 107 are possible on models 01800 and above.

Protective Functions Overview

The frequency inverter FR-F 740 provides a large number of protective functions that protect the drive and the inverter against damage in case of any malfunction.

If an error occurs, the output of the inverter is suspended and the control panel returns an error message.

Display on operation panel FR-DU07	Meaning	Description	Remedy
HOLD ①	Operation panel lock	Operation lock mode ist set.	Press and hold the MODE key for 2 s to enable the operation panel.
Er1 ①	Write disable error	This error occurs when a write operation is attempted with Pr. 77 = 1, the frequency jump ranges overlap, the ranges for the flexible 5-point V/f characteristic overlap or no communication is possible between the control panel and the frequency inverter.	Check the setting of Pr. 77, Pr. 31 to 36 Pr. 100 to 109 and the connection of the operation panel and inverter.
Er2 ①	Write error	This error occurs when a write operation is attempted with the inverter in operation when the value of Pr. 77 <> 2 and an STF or STR start signal is active.	Check the setting of Pr. 77. The frequency inverter must be in stop mode.
Er3 ①	Calibration error	Analog input bias and gain calibration values are too close.	Check the parameter C3, C4, C6 and C7
Er4 ①	Mode designation error	This error occurs when you try to set a parameter in NET mode when PR. 77 <> 2.	Check the setting of Pr. 77. Set the operating mode to operation via control panel.
rE1 ①	Parameter read error	An error occurred in the E²PROM on the operation panel side during parameter copy reading.	Repeat the copy operation. Check the control panel connections. Please contact your nearest MITSUBISHI ELECTRIC representative if the error occurs repeatedly.
rE2 ①	Parameter write error	An error occurred in the E²PROM on the operation panel side during parameter copy writing.	Repeat the copy operation with the inverter stopped. Check the control panel connections. Please contact your nearest MITSUBISHI ELECTRIC representative if the error occurs repeatedly.
rE3 ①	Parameter verification error	Data on the operation panel side and inverter side are different. An error occurred in the E²PROM on the operation panel side during parameter verification.	Press the SET key to continue verification. Check the control panel connections. Please contact your nearest MITSUBISHI ELECTRIC representative if the error occurs repeatedly.
rE4 ①	Model error	A different model was used for parameter write and verification during parameter copy.	Use the same model for parameter copy and verification.
Err.	Error	The RESET signal is active or there is an error in the communication between the frequency inverter and the control panel.	Deactivated the RESET signal. Check the connections between the control panel and the frequency inverter.
OL	Overcurrent during acceleration	If a current of more than 110% ② of the rated inverter current flows in the motor, this function stops the increase in frequency until the overload current reduces to prevent the inverter from resulting in overcurrent shut-off. When the overload current has reduced below 110%, this function increases the frequency again.	Increase the stall prevention operation level with Pr. 22 "stall prevention operation level" or disable stall prevention with Pr. 156 "stall prevention operation selection".
	Overcurrent during constant speed operation	If a current of more than 110% ② of the rated inverter current flows in the motor, this function lowers the frequency until the overload current reduces to prevent overcurrent shut-off. When the overload current has reduced below 110%, this function increases the frequency up to the set value.	
	Overcurrent during deceleration	If a current of more than 110% ② of the rated inverter current flows in the motor, this function stops the decrease in frequency until the overload current reduces to prevent theinverter from resulting in overcurrent shut-off. When the overload current has reduced below 110%, this function decreases the frequency again.	
oL	Overvoltage during deceleration	If the regenerative energy of the motor increases too much to exceed the brake capability, this function stops the decrease in frequency to prevent overvoltage shut-off. As soon as the regenerative energy has reduced, deceleration resumes.	Increase the deceleration time with Pr. 8 "deceleration time".
rb	Regenerative brake prealarm	Too much energy is being fed into the brake resistor (model 01800 and above).	Increase the deceleration time. Check the Pr. 30 and 70 values.
PS	Inverter was stopped via control panel	STOP key on the control panel was pressed during external operating mode.	Check the parameter 77.
TH	Electronic thermal relay function prealarm	The prealarm of the electronic motor protection switch has activated.	The load or number of work cycles is too high.
MT ①	Maintenance signal output	The cumulated operating time has reached the preset value.	The value in Pr. 503 is larger than the setting of Pr. 504.
CP	Parameter copy	Attempt to perform a copy operation from a frequency inverter model 01160 or lower to a model 01800 or higher.	Reset parameters 9, 30, 51, 52, 54, 56 57, 61, 70, 72, 80, 90, 158, 190-196 and 893.
FN	Fan fault	The cooling fan is not operating as set in Pr. 244.	Replace the cooling fan.

Display on operation panel FR-DU07	Meaning	Description	Remedy
E.OC1	Overcurrent 1 (acceleration)	The output current of the inverter has reached or exceeded 200% of the rated current during the acceleration, deceleration, or at constant speed.	The cause for the activation of the protective function is a short circuit or a ground fault across the main outputs, an exceeding moment of inertia of the load (GD^2), too short acceleration / deceleration time presets, restart during a motor idling phase, operation of a motor with an exceeding capacity. Overheating due to insufficient cooling (defective cooling fan or choked heat sink).
E.OC2	Overcurrent 2 (const. speed)		
E.OC3	Overcurrent 3 (deceleration)		
E.OV1	Overvoltage 1 (acceleration)	The converter voltage has increased highly due to regenerative energy. The overvoltage limit was exceeded during acceleration, deceleration, or at constant speed.	In most cases the protective function is activated due to a too short deceleration time preset or a regenerative overload. Remedy by increasing the deceleration time of connecting an external brake unit. An overvoltage in the mains power supply activates this protective function as well.
E.OV2	Overvoltage 2 (constant speed)		
E.OV3	Overvoltage 3 (deceleration)		
E.THM	Motor overload shutoff	The electronic overload protection for the motor or inverter was activated. The electronic motor protection switch continually detects the motor current and the output frequency of the inverter. If a self-cooling motor operates over a long period at low speed but high torque, the motor is thermally overloaded and the protective function is activated. If several motors are operated by one inverter the motor protection switch will not operate properly. In this case deactivate the motor protection and replace it by external protection switches.	Decrease the motor load to avoid an activation. Check whether the performance range of the motor and inverter correspond.
E.THT	Inverter overload shutoff		
E.FIN	Fin overheat	In case of an overheating of the heat sink the temperature sensor responds and the inverter is stopped.	Check ambient temperature.
E.IPF	Instantaneous power failure protection	The output of the inverter is suspended and the alarm message returned, if the power supply fails for more than 15 ms. If the power supply fails for more than 100 ms, the inverter shuts down completely. In this case after restoring the power supply the inverter is in the power ON state. If the power failure stays below 15 ms, the operation is proceeded normally.	Check the power supply.
E.UVT	Undervoltage protection	The input voltage of the inverter has fallen below the minimum value. The protective function is activated, if the input voltage falls below the minimum value.	An undervoltage can occur, if the capacity of the mains transformer is not sufficient or if a high capacity motor is turned ON connected to the same mains supply circuit.
E.ILF ①	Input phase failure	Open phase at power supply input.	Check the power supply connections and the mains fuse!
E.OLT	Stall prevention overload	A long lasting excess of the current limit (OL display) shut down the inverter.	Reduce the load. Check the preset values for the current limit (parameter 22) and the stall prevention selection (parameter 156).
E.GF	Ground failure	An overcurrent occured due to a ground failure upon the inverter output (load).	Check load connections (motor circuit).
E.LF	Output phase failure protection	One of the phases (U, V, W) is not connected.	Check the connections.
E.OHT	Activation of an external motor protection relay (thermal contact)	An external motor protective switch was activated. If an external motor protective switch for thermal monitoring is used, this switch can activate the protective function of the inverter.	Leitungen und Anschlüsse am Eingang prüfen
E.PTC ①	PTC thermistor operation	The frequency inverter has shut down because the resistance of the PTC thermistor has exceeded the permitted 500Ω2–4kΩ2 range for 10s.	Check the PTC connection. Check motor operation under load. Check setting of Pr. 184.
E.OPT	Option alarm	This error is displayed when an FR-HC, MT-HC or FR-CV external optional unit is installed and the power supply is still connected via terminals L1, L2 and L3.	Check the setting of Pr. 30 and the installation and connections of the optional unit.
E.OP1	Option slot alarm	The protective function is activated for a fault (e.g. transmission error) of an internal optional unit.	Check the function settings of the optional unit.
E.1	Option alarm (e. g. connection or contact fault)	This protective function is activated when an error (e.g. a contact fault) is registered in the installed optional unit.	Check the connections of the optional unit. Check for electromagnetic interference.
E.PE	Parameter storage device alarm (control circuit board)	Error on access of the data memory of the inverter.	Please contact your nearest MITSUBISHI ELECTRIC representative if the error occurs repeatedly.
E.PE2 ①	Parameter storage device alarm (main circuit board)	Error on access of the data memory of the inverter.	Please contact your nearest MITSUBISHI ELECTRIC representative if the error occurs repeatedly.

Display on operation panel FR-DU07	Meaning	Description	Remedy
E.PUE	PU disconnection	A connection error between inverter and control panel occurred during operation. This alarm is only returned, if parameter 75 is set to "2", "3", "16", or "17".	Check the connection of control panel.
E.RET	Retry count excess	After activation of a protective function the inverter failed to be restarted automatically within the number of retries specified in parameter 67.	Remedy the actual cause of the originary protective function.
E.CPU	CPU error	Communication error with the built-in CPU	Please contact your nearest MITSUBISHI ELECTRIC representative if the error occurs repeatedly.
E. 6	CPU error		
E. 7	CPU error		
E.CTE	Operation panel/RS-485 terminal power supply short circuit	The operation panel power supply is shorted.	Locate and correct the short. Check the control panel and the connection cable.
E.P24	24 V DC power supply short circuit	The 24 V DC power output from the PC terminal is shorted.	Locate and correct the short.
E.CdO ①	Output current detection value exceeded	The max. output current set in Pr. 150 has been exceeded.	Check the setting of Pr. 150, 151, 166 and 167.
E.IOH ①	Inrush resistance overheat	This error occurs when the inrush current limiter overheats.	Reduce the inrush current. Avoid switching operations during the switch-on phase.
E.SEr ①	Communication error (inverter)	Communication error at the RS-485 port.	Check the wiring.
E.AIE ①	Analog input error	Invalid signal (>30 mA or >7.5 V) at the analog input programmed with the current setting value function.	Check the setting of Pr. 73 and Pr. 267.
E.BE	Brake transistor alarm detection/Internal circuit error	For the 01800 or more: Inverter output stop if an alarm occurs in the brake circuit, e.g. damaged brake transistor. For 01160 or less: Internal circuit error	Reduce the load inertia. Check the frequency of using the brake and the brake transistor.
E.13 ①	Internal circuit error	Error in the internal circuit of the device.	Please contact your nearest MITSUBISHI ELECTRIC representative if the error occurs repeatedly.

① If when employing the control panel FR-PU04 one of the errors HOLD, Er1 to 4, rE1 to 4, MT, E.ILF, E.PTC, E.PE2, E.CDO, E.IOH, E.SER, E.AIE, E.13 occurs, then Fault 14 will be displayed.

② When the overload capacity is 150% the limit is 120%.

Resetting Methods

When a protective function is activated, the output of the inverter is switched off. The motor coasts to a halt. The output remains switched off until the error cause is eliminated and the inverter reset.
The inverter can be reset following four different methods:

- Switch the power supply OFF and ON again.
- Switch the reset signal ON for at least 0.1 s.
- Press the RESET key on the control panel.
- Use the automatic restart function (Pr. 65, Pr. 67-69)

If the reset signal is ON continuously, the operation panel FR-DU07 returns an error message while the control unit FR-PU04 indicates that the reset procedure is in progress.

When a protective function is activated, the operation panel FR-DU07 returns an error code as listed in the table above.
The control panel FR-PU04 returns error messages in clear.

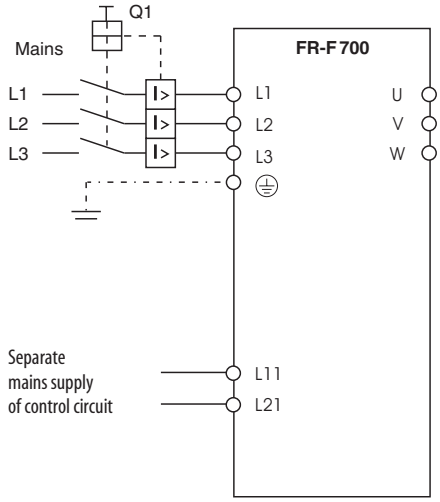
If on occurrence of an error the input protection contactor is toggled the error message cannot be retained, since there is no power supply for the control circuit.
If the error message is intended to be retained in spite of an activation of the protectve contactor, the control circuit has to be supplied by a separate power supply.

Separate power supply for the control circuit

The figure on the right shows the connection of the separate 380-480 V AC (-15%/+10%) power supply for the control circuit. The current consumption is 2 A.

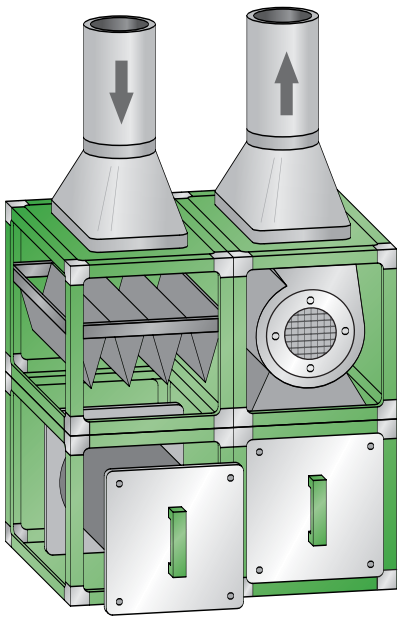
Prior to the connection remove the two short bars upon L11 and L21 on the inverter.

Please refer to the according manual for a precise description of the connection.



Application Examples

Ventilation system



Ventilation systems of modern painting plants often have high-powered motors. This makes them an ideal application for frequency inverters, which can replace the contactors and "soft starter" systems with bypass circuits that are often used in these installations.

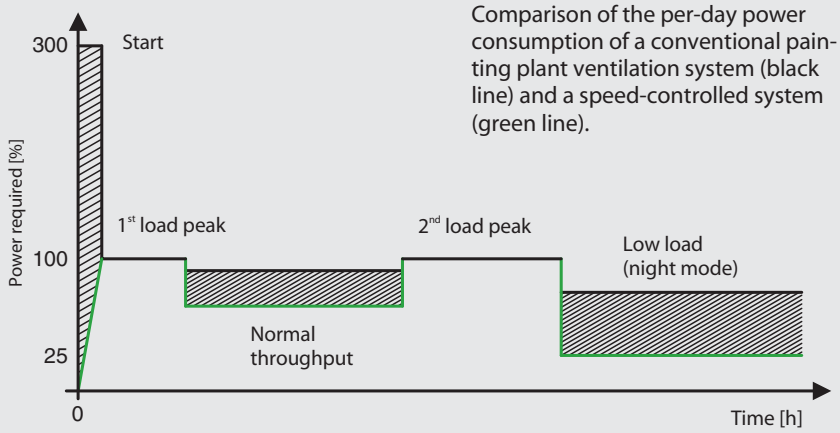
The higher initial investment involved in installing frequency inverters can pay for itself in a very short time because of the many benefits of this solution.

Benefits

- Reduction of switch-on and start-up currents, also compared to soft starter systems, thus reducing peak load power costs.
- Gentle flying starts for fans that are already rotating in duct drafts, thus increasing general system service life.
- Motor speed reduction for lower throughput at low demand times without dampers for significant power savings.
- No need for bypass contactors.
- Motor pre-heating is possible.
- With properly-dimensioned drive systems and brake modules you can also stop the fans quickly, for example when fir extinguishing gas needs to be used.

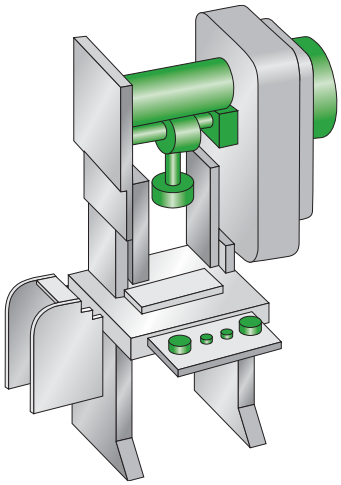
Specifications

- Drive system with 4-pole motor, 132 kW
- Frequency inverter: FR-F 740-03250 EC
- Acceleration/braking times: 360 s
- S-ramp programming
- Flying start function
- Optimum Excitation Control function
- Regeneration avoidance function
- Control via analog signal (0-10 V)
- Output frequency range 22-50 Hz
- Average power consumption of conventional system per 24 h: 2,890 kWh
- Average power consumption of frequency inverter system per 24 h: 2,610 kWh



Comparison of the per-day power consumption of a conventional painting plant ventilation system (black line) and a speed-controlled system (green line).

Stamping press
(small metal parts production)



Retrofitting this stamping press with the FR-F 740 frequency inverter brought significant energy savings. The secret is the FR-F 740's intelligent Flux Optimisation mode. During the phase of the stamping sequence with low overload requirements Flux Optimisation mode quickly reduces the motor voltage.

Die kurze Regelzeit der Flux-Optimisation ist der Schlüssel zum Erfolg: Die Spannung wird für den nächsten Stanz-Vorgang wieder angehoben.

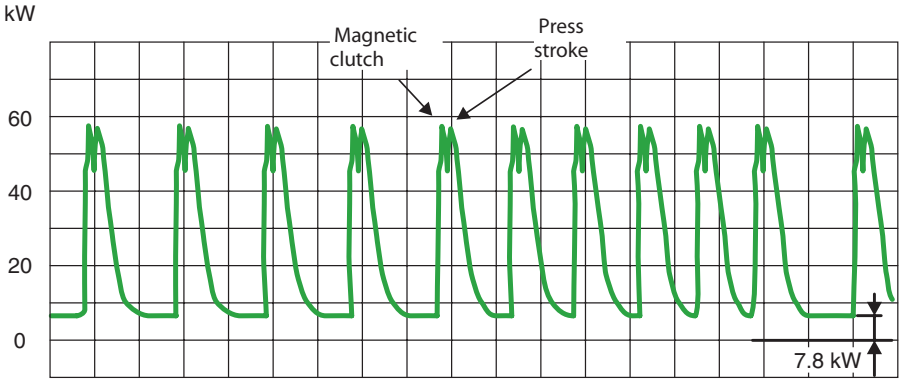
Specifications

- Manually-operated stamping press with 400 tons stamping pressure
- Powered by a 4-pole motor (55 kW)
- Frequency inverter: FR-F 740-75k
- Operation: The press is operated with the motor running at constant speed. During the stamping sequence the power required for punching out the metal components is transferred briefly to the punch by engaging a magnetic clutch coupling.
- Power consumption:
  As the graphs below show, the power consumption of the press is identical for both pressing operations.
  However, the low load cycle power consumption (magnetic clutch disengaged) drops when a frequency inverter is used:
  Normal operation of the stamping press: 7.8 kW
  Stamping press operated with frequency inverter: 5.3 kW
- Depending on the design of the drive system used it may also be necessary to use an (optional) brake resistor in applications like this.

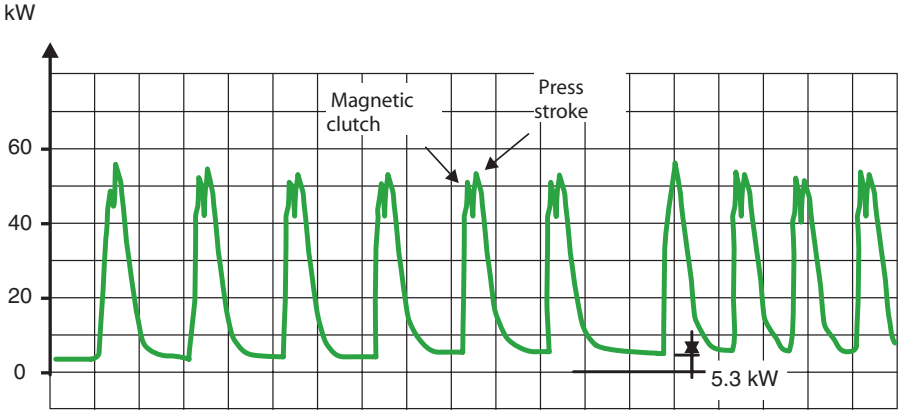
Benefits

- Energy savings
  Flux optimisation mode prevents unnecessary power consumption. Energy is conserved in every phase of the cycle when the motor load is less than 100%.
- Simple installation
  Retrofitting applications like this stamping press with a frequency inverter is very quick and trouble-free.
- Enhanced precision
  The option of variable motor speed provides better control over your application and thus improves manufacturing precision and product quality.

Normal operation without Flux Optimisation



Operation of the press with Flux Optimisation

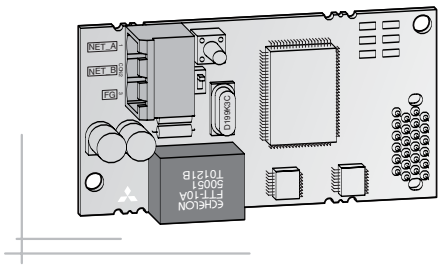


Internal and External Options

A large number of options allows an individual adoption of the inverter to the according task. The options can be installed quickly and easily. Detailed information on installation and functions is included in the manual of the options.

The options can be divided into two major categories:

- Internal options
- External options



Internal options

The internal options comprise input and output extensions as well as communications options supporting the operation of the inverter within a network or connected to a personal computer or PLC.

Option			Type	Description	Remarks/Specifications	Art. no.
Internal options	16-bit digital input		FR-A7AX	Interface for the input of the frequency setting via 4-digit BCD or 16-bit binary code, setting of gain and bias supported.	Input: 24 V DC; 5 mA; open collector or switching signal, sink or source logic	156775
	Digital output		FR-A7AY	Selectable of 43 standard output signals of the inverter can be output at the open collector. The outputs are isolated with optocouplers.	Output load: 24V DC; 0.1 A, sink or source logic	156776
	Expansion analog output			Selectable 2 of 18 additional signals (e.g. output frequency, output voltage, output current) can be output and indicated at the FM / AM output. Display on measuring gauge: 20 mA DC or 5 V (10 V) DC	Output: max. 0–10 V DC; 0–20 mA; Resolution: 3 mV at voltage output, 1 µA at current output, accuracy: ±10%	
	Relay output		FR-A7AR	Selectable 3 of 43 standard output signals of the inverter can be output through relay terminals.	Switching load: 230 V AC/0.3 A, 30 V DC/0.3 A	156777
	Communications	CC-Link	FR-A7NC	Option board for the integration of a frequency inverter into a CC-Link network. The operation, display functions, and parameter settings can be controlled by a PLC.	Maximum transfer distance: 1200 m (at 156 kBaud)	156778
		LonWorks	FR-A7NL	Option board for integration of a frequency inverter in a LonWorks network. Operation, display functions and parameter settings can be controlled by a computer (PC etc.) or a PLC.	Connection of up to 64 inverters supported. Maximum transfer rate: 78 kBaud	156779
		Profibus/DP	FR-A7NP	Option board for the integration of a frequency inverter into a Profibus/DP network. The operation, display functions, and parameter settings can be controlled by a computer (PC etc.) or a PLC.	Connection of up to 126 inverters supported. Maximum transfer rate: 12 MBaud	158524
		DeviceNet ™	FR-A7ND	Option board for the integration of a frequency inverter into a DeviceNet. The operation, display functions, and parameter settings can be controlled by a computer (PC etc.) or a PLC.	Maximum transfer rate: 10 MBaud	158525

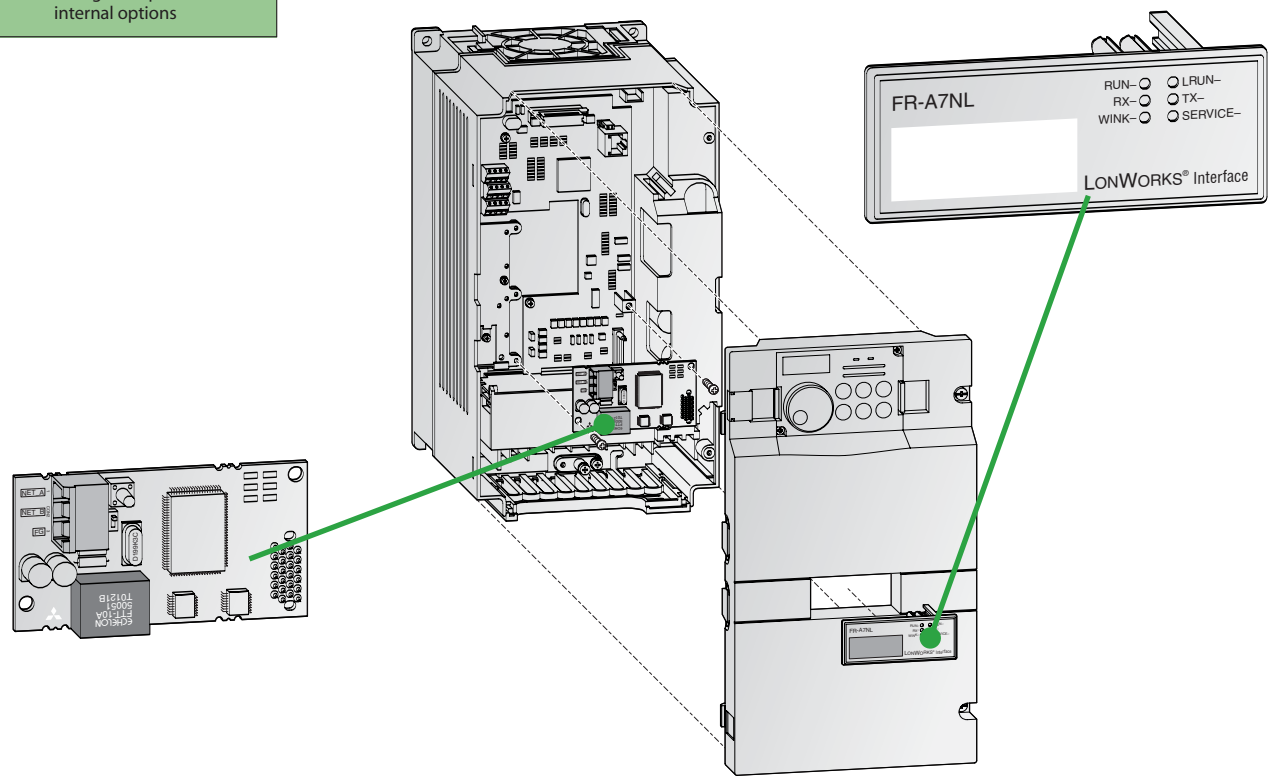
External Options

In addition to the FR-PU04 control panel that enables interactive operation of the frequency inverter the available external options also include additional EMC noise filters, reactors for improving efficiency and brake units with brake resistors.

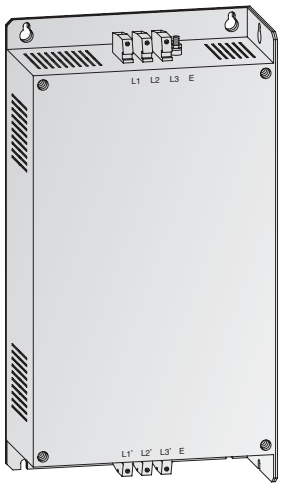
Option		Type	Description	Remarks/Specifications	Art. no.
Externe Optionen	Control panel (8 languages)	FR-PU04	Interactive control panel with LCD display.	Refer to p.18 for detailed descriptio	67735
	Connecting cable for remote control panel	FR-A5 CBL	Cable for a remote connection of the control panel FR-DU07 or FR-PU04.	Available length: 1; 2.5 and 5 m	1 m: 70727 2.5 m: 70728 5 m: 70729
	Adapter	FR-ADP	Connection adapter for FR-DU07	Required for remote connection of the FR-DU07 with FR-A5CBL	157515
	Connection cable	SC-FR PC	Communications cable for RS232 or RS485 interface to connect an external personal computer	Length 3 m; can be used for example with the VFD setup software	88426
	USB-RS232 converter		Port converter adapter cable from RS-232 to USB	USB specification 1.1, 0.35 m long	155606
	VFD setup software	FR-SW0-SETUP-W☐	Parameterization and setup software for the whole FR-F 700 series as well as all other Mitsubishi inverter series.	English/German	159746
	EMC noise filter	FFR -☐☐, FN -☐☐	Noise filter for compliance with EMC directives.	Refer to p.36 for detailed description	see p. 36
	DC converter circuit choke coil	MT-HEL ①	DC reactor for compensation of voltage fluctuations.	Refer to p.37 for detailed description	see p.37
	Mains power chokes	FR-BAL-B	For increased efficiency, reduction of mains feedback and compensation of voltage fluctuations.	Refer to p.37 for detailed description	see p . 37
	Brake units	MT-BU 5, BU-UFS	For an improvement of the brake capacity. For high inertia loads and active loads. Used in combination with a resistor unit.	Refer to p.38 and p. 39 for detailed description	see p.38 and p. 39
	External brake resistors	MT-BR 5, RUFC	To improve the brake capacity of the inverter; is used in combination with a brake unit	Refer to p.38 ans p. 39 for detailed description	see p.38 ans p. 39

① A DC reactor is included as standard equipment with frequency inverters FR-F 740-01800 through 12120. These reactors are essential for operation and must be installed.

Mounting examples for internal options



■ Noise Filters for FR-F 740-00023 to FR-F 740-01160



Environment 1 noise filters

The noise filters listed below make it possible to comply with the requirements for Environment 1 (unrestricted distribution) with shielded motor cables up to 20m long and the requirements of Environment 1 (restricted distribution) with shielded motor cables up to 100m long. This also provides compliance with the 100A limits for Environment 2 with shielded cables up to 100m long.

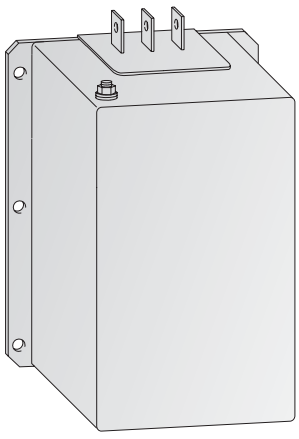
The frequency inverters of the FR-F 740 series are fitted with an integrated EMC noise filter for industrial environments (Environment 2). The filters listed here are thus only necessary for these inverters in special cases.

The FN 3359-□□□ filters enable compliance with the requirements for Environment 1 (restricted distribution) with shielded motor cables up to 100m long, and thus also with the requirements for Environment 2 with cables of the same length.

Th FFR-A540-□□□A-SF100 filters are configured for "footprint" installation, which means that the base plate of the frequency inverter is bolted onto the filter unit, so that the entire assembly can then be bolted onto the mounting plate in a switchgear cabinet.

Filter	Inverter	Power loss [W]	Leakage current [mA]	Rated current [A]	Weight [kg]	Art. no.
FFR-A540-8A-SF100	FR-F 740-00023 – 00052	5	< 30	8	1.5	104741
FFR-A540-16A-SF100	FR-F 740-00083	8	< 30	16	1.5	104752
FFR-A540-30A-SF100	FR-F 740-00126 – 00250	14	< 30	30	1.8	104753
FFR-F740-55A-SF100	FR-F 740-00310 – FR-F740-00380	34	< 30	55	3	157395
FFR-A540-75A-SF100	FR-F 740-00470 – FR-F740-00620	34	< 30	75	4.1	104755
FFR-A540-95A-SF100	FR-F 740-00770	36	< 30	95	6.7	104756
FFR-A540-120A-SF100	FR-F 740-00930	34	< 30	120	9.7	151881
FFR-A540-180A-SF100	FR-F 740-01160	62	< 30	180	10.8	104757

■ Noise Filters for FR-F 740-01800 to FR-F 740-12120



Noise filters for high capacities

The extremely compact line of FN 3359 filters provides the user with an efficient noise suppression at low room requirements.

The FN 3359 filters are suitable for noise suppression conforming to EN 61800-3.

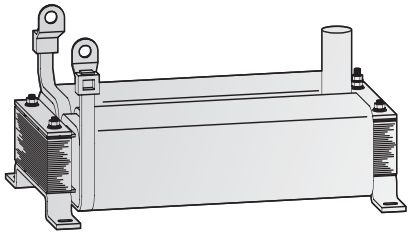
The filters are designed to reduce cable-induced interference to levels that comply with the Environment 1 and 2 requirements.

"Footprint" installation on the frequency inverter base plate is not possible with the FN3359-□□□-28/99 filters. These units must be installed next to the frequency inverter.

Filter	Inverter	Power loss [W]	Leakage current [mA]	Rated current [A]	Weight [kg]	Art. no.
FN 3359-180-28	FR-F 740-01800	34	< 6	180	6.5	141097
FN 3359-250-28	FR-F 740-02160	38	< 6	250	7	104663
FN 3359-400-99	FR-F 740-02600 – FR-F740-03610	51	< 6	400	10.5	104664
FN 3359-600-99	FR-F 740-04320 – FR-F740-05470	65	< 6	600	11	104665
FN 3359-1000-99	FR-F 740-06100 – FR-F740-09620	84	< 6	1000	18	104666
FN 3359-1600-99	FR-F 740-10940 – FR-F740-12120	130	< 6	1600	27	130229

These filters enable compliance with the requirements for Environment 1 (restricted distribution) with shielded motor cables up to 100m long, and thus also with the requirements of Environment 2 with the same cable lengths.

DC Reactors



DC link reactors

A DC link reactor is included as standard equipment with frequency inverter models FR-F740-01800 and above. This reactor is essential for the operation of the inverter and must be installed.

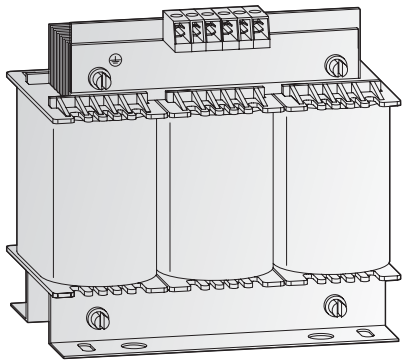
The reactors listed below are available as optional equipment for frequency inverter models FR-F740-00023 through 01160.

Application (inverter)	Reactor	Power loss [W]		Weight [kg]	Art. no.
		at 120%	at 150%		
FR-F 740-01800	FR-HEL-H90K	128	121	20	The DC link reactor MT-HEL is included as standard equipment with the respective frequency inverter.
FR-F 740-02160	FR-HEL-H110K	138	128	22	
FR-F 740-02600	FR-HEL-H132K	140	138	26	
FR-F 740-03250	FR-HEL-H160K	162	140	28	
FR-F 740-03610	FR-HEL-H185K	245	162	29	
FR-F 740-04320	FR-HEL-H220K	265	245	30	
FR-F 740-04810	FR-HEL-H250K	285	265	35	
FR-F 740-05470	FR-HEL-H280K	315	285	38	
FR-F 740-06100	FR-HEL-H315K	350	315	42	
FR-F 740-06830	FR-HEL-H355K	400	350	46	
FR-F 740-07700	FR-HEL-H400K	460	400	50	
FR-F 740-08660	FR-HEL-H450K	540	460	57	
FR-F 740-09620	FR-HEL-H500K	635	540	67	
FR-F 740-10940	FR-HEL-H560K	770	635	85	
FR-F 740-12120	FR-HEL-H630K	960	770	95	

Note:

A three-phase mains supply choke (see below) can also be used as an alternative to the DC link reactor on frequency inverter models FR-F740-01160 and below.

Power Chokes for Three-Phase Current



Three-phase mains supply chokes

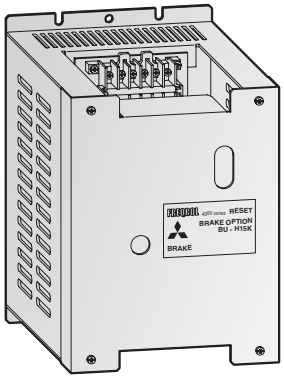
The three-phase mains supply chokes FR-BAL-B-□□k for the frequency inverters FR-A 740 EC compensate voltage fluctuations and simultaneously increase the efficiency.

Applying the appropriate power choke an overall efficiency of up to 90% can be achieved.

The use of a power choke is especially recommended for mains circuits where high capacities are switched, for example, via thyristors.

Inverter	Choke	L [mH]	Current [A]	Power loss [W]	Weight [kg]	Art. no.
FR-F740-00023 – 00083	FR-BAL-B-4,0 k	2.340	12	31	3.0	87244
FR-F740-00126	FR-BAL-B-5,5k	1.750	16	44	3.7	87245
FR-F740-00170	FR-BAL-B-7,5 k	1.220	23	59	5.5	87246
FR-F740-00250 – 00380	FR-BAL-B-11k/-15 k	0.667	42	68	10.7	71053
FR-F740-00470	FR-BAL-B-22 k	0.483	58	77	11.2	87247
FR-F740-00620	FR-BAL-B-30 k	0.369	76	86	11.6	87248
FR-F740-00770	FR-BAL-B-37 k	0.295	95	113	18.6	87249
FR-F740-00930	FR-BAL-B-45 k	0.244	115	118	21.4	71054
FR-F740-01160	FR-BAL-B-55 k	0.191	147	120	22.6	87250

Brake Unit MT-BU5

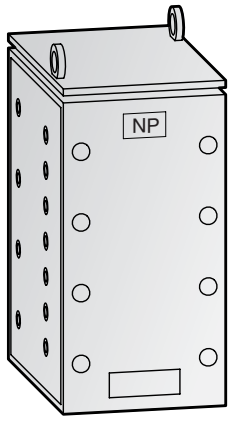


The MT-BU5 external brake units can be used with frequency inverter models FR-F740-01800 and above. These inverters are fitted with a connector via which the MT-BU5 brake unit is controlled directly. This connection also makes it possible for the FR-F740 to handle the protection of the MT-BU5 against thermal overloads.

Brake resistors must be chosen in accordance with your application's requirements. The configurations in the table are only general recommendations. Please consult Mitsubishi Electric for advice on matching the correct brake modules and brake resistors for your application.

Inverter	Brake unit	Number of required units	Braking torque	Art. no.
FR-F740-01800	MT-BU5-H75 k	1 x MT-BR5-H75 k	100%, 10% ED	125700
FR-F740-02160 – 03250	MT-BU5-H150 k	2 x MT-BR5-H75 k	100%, 10% ED	125701
FR-F740-03250 – 04320	MT-BU5-H220 k	3 x MT-BR5-H75 k	100%, 10% ED	125702
FR-F740-04320 – 05470	MT-BU5-H280 k	4 x MT-BR5-H75 k	100%, 10% ED	125703
FR-F740-05470 – 07700	MT-BU5-H375 k	5 x MT-BR5-H75 k	100%, 10% ED	125705

External Brake Resistor MT-BR5 for Brake Unit MT-BU5



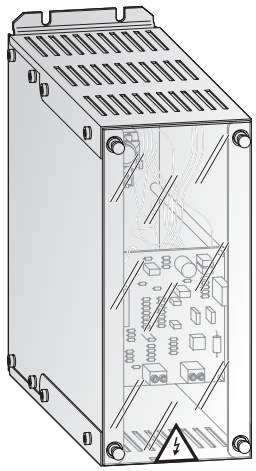
The brake resistor MT-BR5 for the frequency inverters FR-F 740 EC/E1 is used exclusively in combination with a brake unit

Important:

- The regenerative brake duty should be set at levels below the permissible brake duty specified in the table above.
- Since the temperature of the brake resistor may exceed 300°C take care to provide a sufficient heat dissipation.

Brake resistor	Regenerative brake duty	Resistance [Ω]	Art. no.
MT-BR5-H75 k	6%	6.5	125699

Brake Units BU-UFS



For a braking torque higher than 20% or a duty cycle higher than 30% an external brake unit including the adequate brake resistors has to be installed.

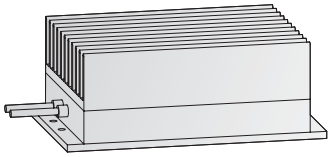
The brake units BU-UFS listed below are cascadable so that the optimum dimensioning can always be achieved.

The brake units here are not fitted with brake resistors, which must be ordered separately (see below).

The configurations in the table are only general recommendations. Please consult Mitsubishi Electric for advice on matching the correct brake modules and brake resistors for your application.

Inverter	Brake unit	Max. peak current [W]	Max. instantaneous power [kW]	Max. duty cycle	Art. no.
FR-F740-00023 – 00250	BU-UFS22	34	25	10%	127947
FR-F740-00250 – 00470	BU-UFS40	55	41	10%	127948
FR-F740-00470 – 01160	BU-UFS110	140	105	5%	127950

Brake Resistors for Brake Unit BU-UFS

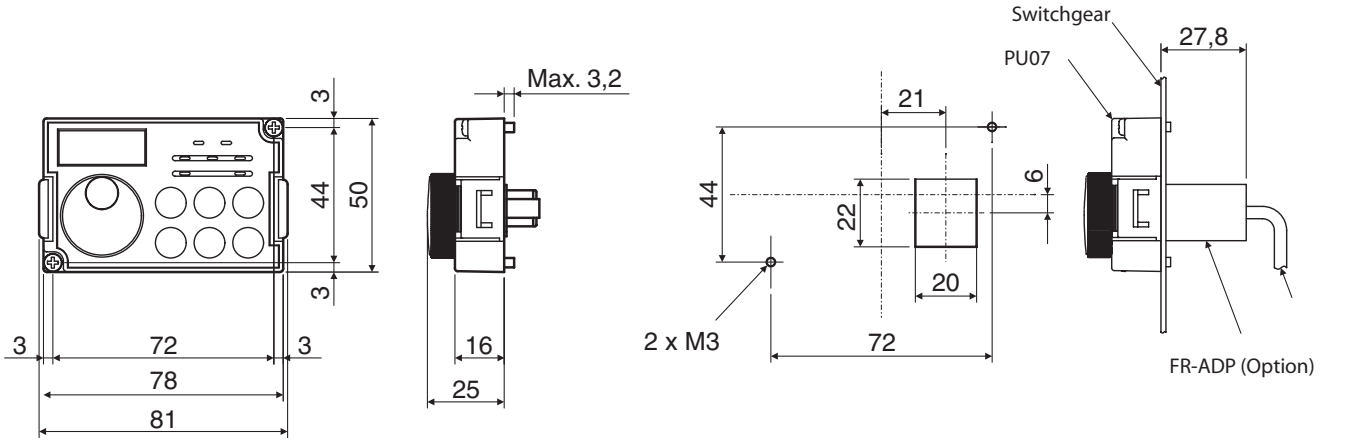


The brake resistors RUFC for the frequency inverters FR-F 740 EC/E1 are designed for the exclusive use in combination with a brake unit BU-UFS.

Please, note the specifications for the allowed duty cycle (ED max.) included in the instruction manual for the brake unit!

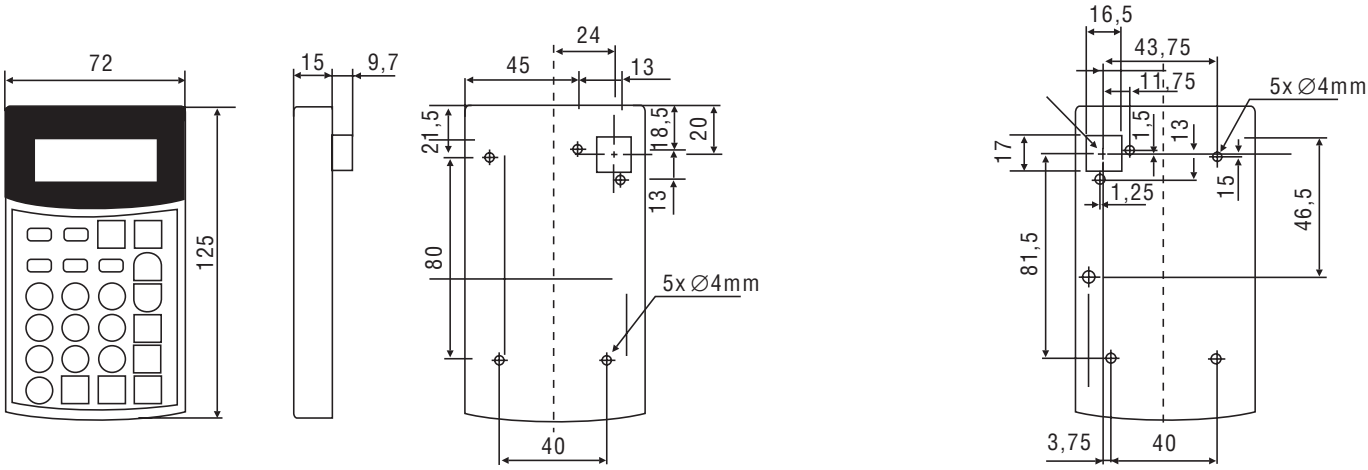
Type	Application	Regenerative brake duty	Resistance [Ω]	Capacity [W]	Art. no.
RUFC22	BU-UFS 22	10%	1 x 24	2000	129629
RUFC40 (Set)	BU-UFS 40	10%	2 x 6.8	2000	129630
RUFC110 (Set)	BU-UFS 110	10%	4 x 6.8	2000	129631

Operation panel FR-DU07

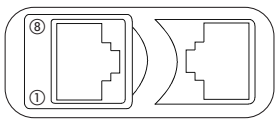


All dimensions in mm

Control panel FR-PU04



All dimensions in mm



① SG ⑤ SDA
② P5S ⑥ RDB
③ RDA ⑦ SG
④ SDB ⑧ P5S

Connection of the control panel

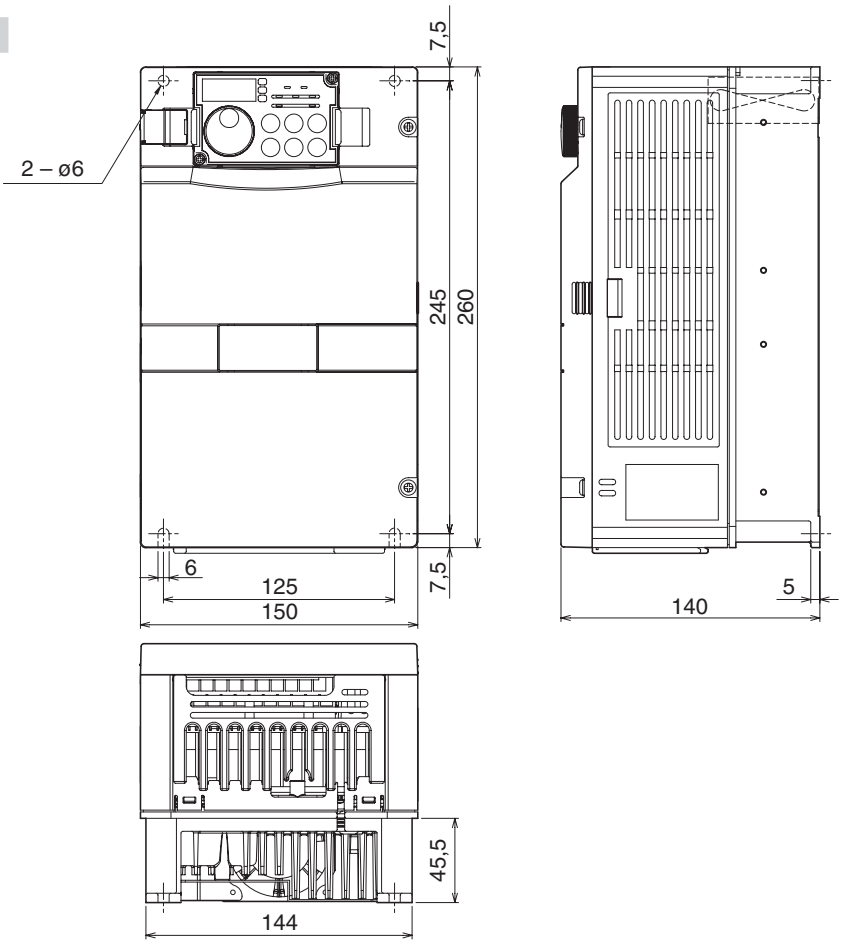
The control panel can be connected to the inverter remotely via the connecting cable type FR-A5-CBL (1m; 2.5m; 5m). You must only use the original MITSUBISHI ELECTRIC cable. This cable is available as optional accessory. Plug the cable in the according connectors on the control panel and the inverter.

The figure besides shows the pin assignment of the connector plugs.

Never connect fax modems or modular telephone plugs with the connectors. Otherwise, the inverter might be damaged.

The connection of the control panel can be done with the communications cable SC-FR PC. A connection of the control panel to a personal computer is possible too.

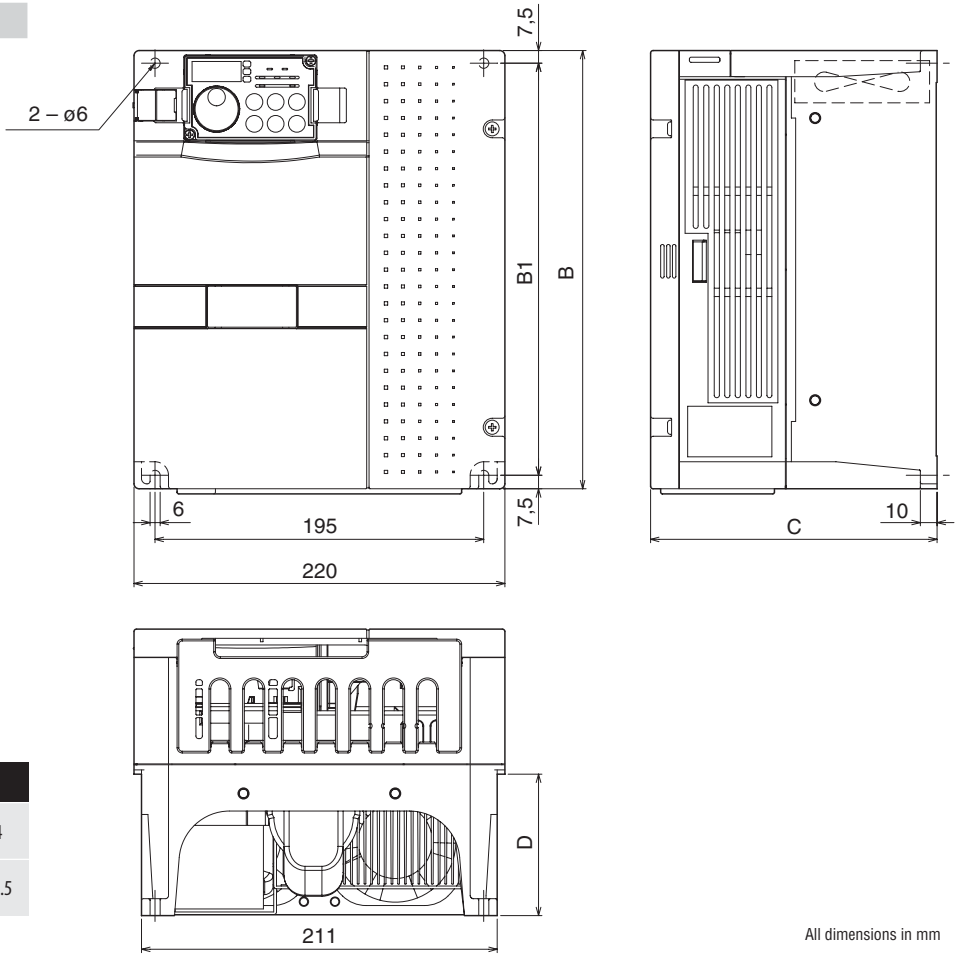
FR-F 740-00023 – 00126



Note:
Models 00023 through 00052 do not have internal fans.

All dimensions in mm

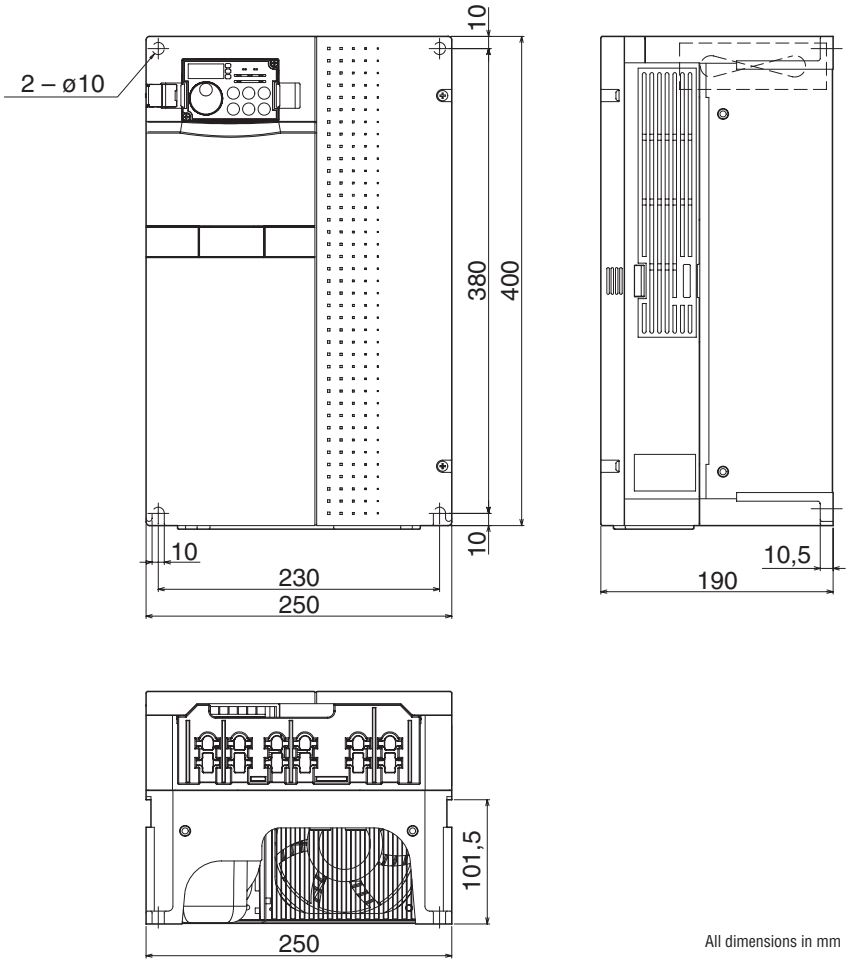
FR-F 740-00170 – 00380



Type	B	B1	C	D
FR-F740-00170, FR-F740-00250	260	245	170	84
FR-F740-00310, FR-F740-00380	300	285	190	101.5

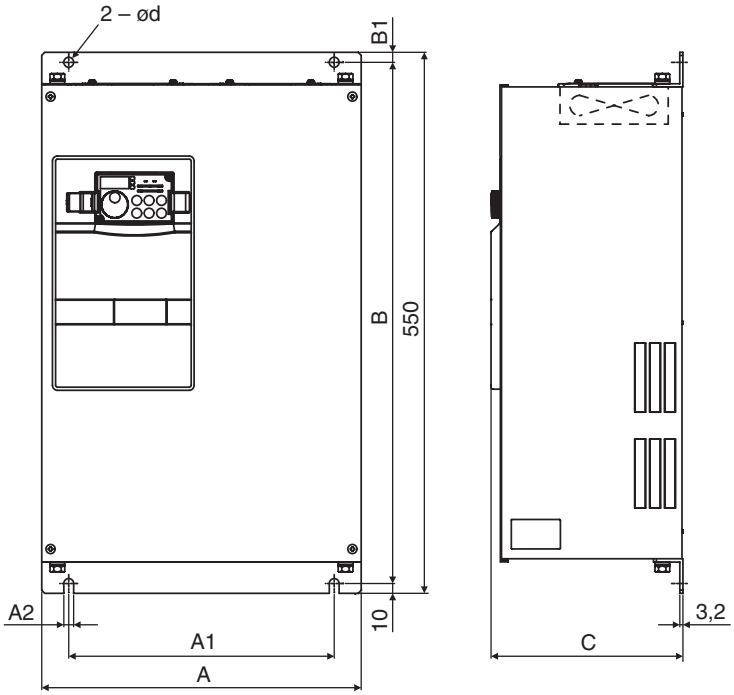
All dimensions in mm

■ FR-F 740-00470 – 00620

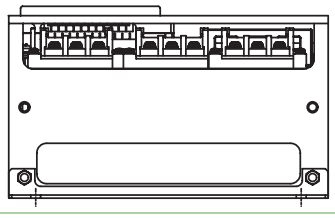


All dimensions in mm

■ FR-F 740-00770 – 01160

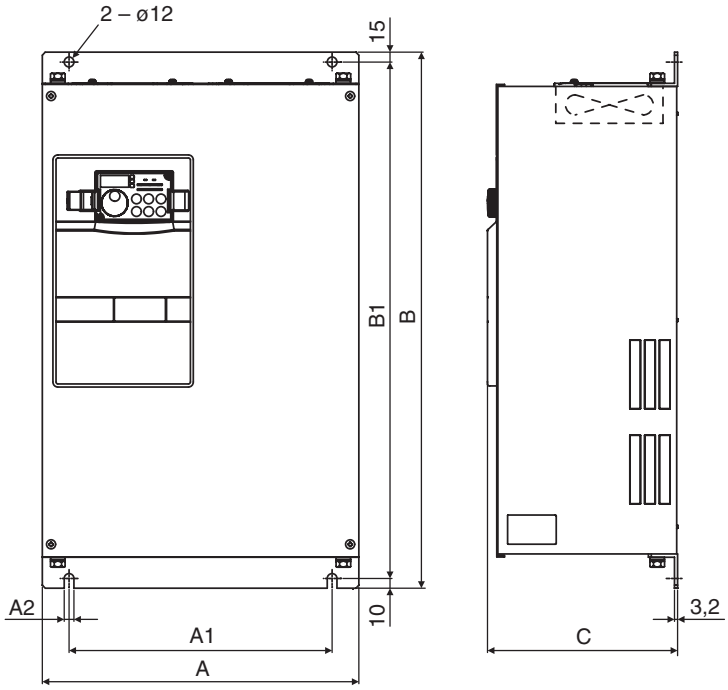


Type	A	A1	A2	B	B1	C	d
FR-F740-00770	325	270	10	530	10	195	10
FR-F740-00930, FR-F740-01160	435	380	12	525	15	250	12



All dimensions in mm

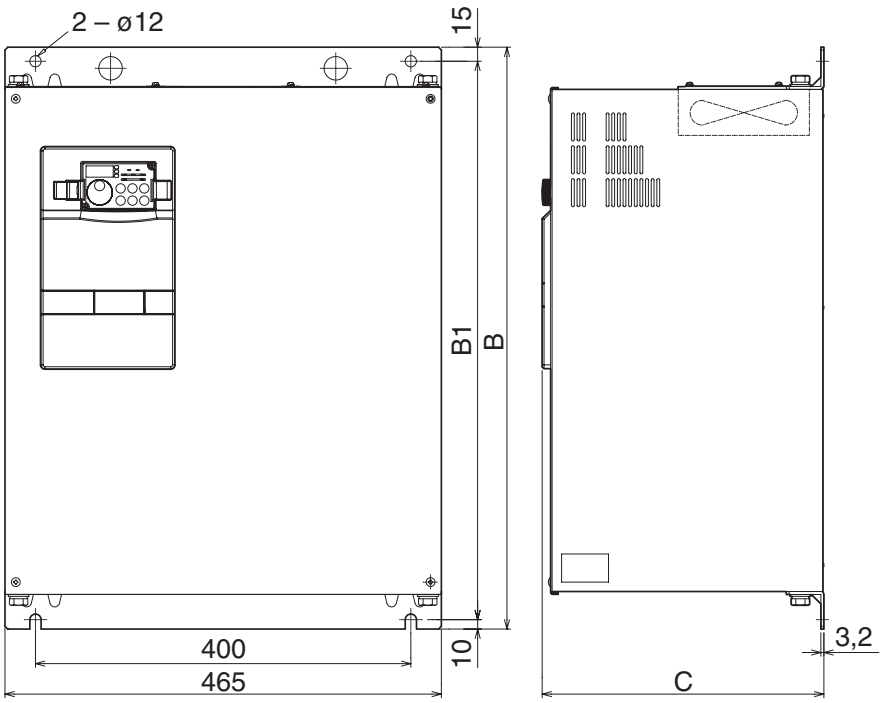
FR-F 740-01800 – 02160



Type	A	A1	A2	B	B1	C
FR-F740-01800	435	380	12	550	525	250
FR-F740-02160	465	400	32,5	620	595	300

All dimensions in mm

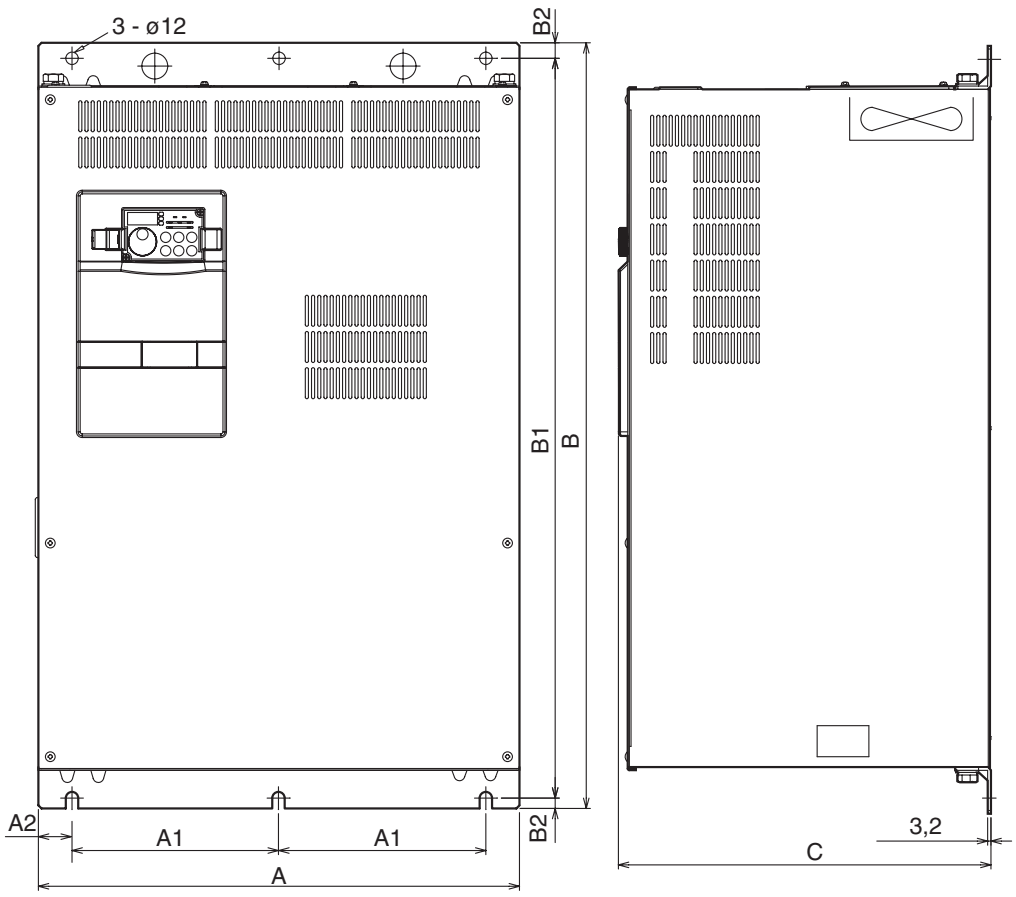
FR-F 740-02600 – 03610



Type	B	B1	C
FR-F740-02600	595	620	300
FR-F740-03250, FR-F740-03610	715	740	360

All dimensions in mm

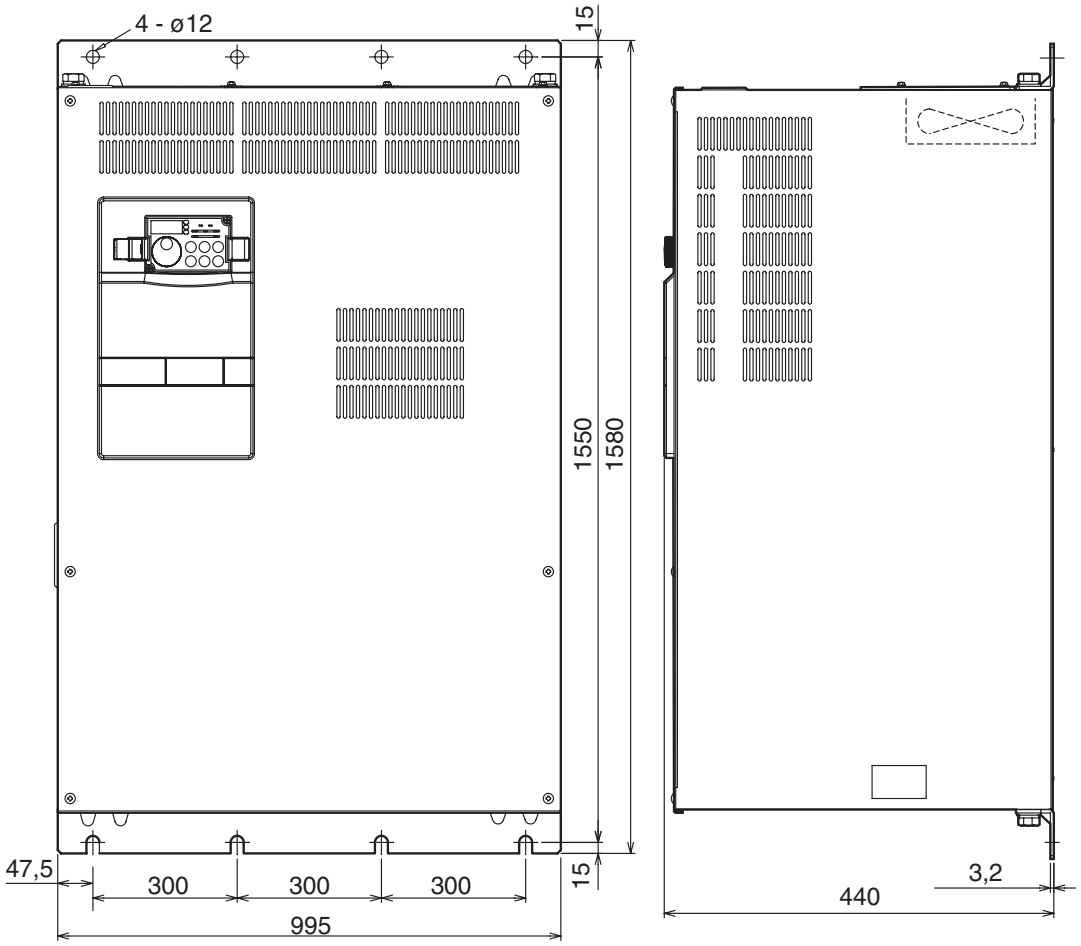
FR-F 740-04320 – 08660



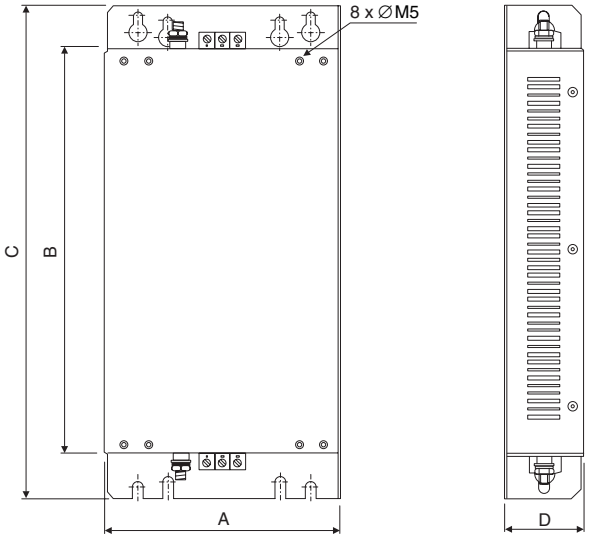
All dimensions in mm

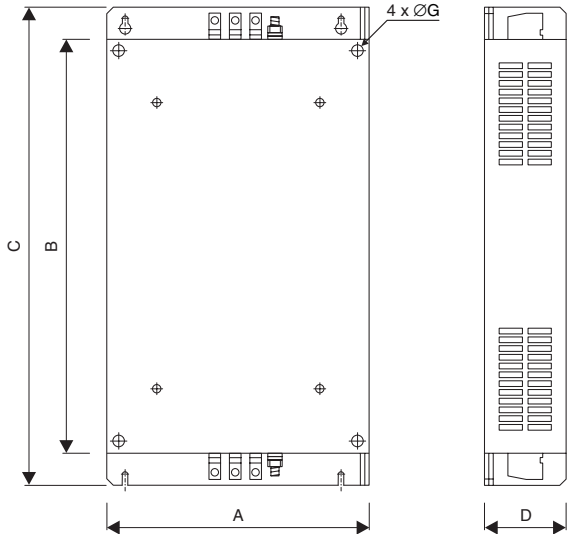
Type	A	A1	A2	B	B1	B2	C
FR-F740-04320 – FR-F740-04810	498	200	49	1010	984	13	380
FR-F740-05470 – FR-F740-06830	680	300	40	1010	984	13	380
FR-F740-07700 – FR-F740-08660	790	315	80	1330	1300	15	440

FR-F 740-09620 – 12120



Special Noise Filters FFR-A540-8A-SF100 to FFR-A540-180A-SF100





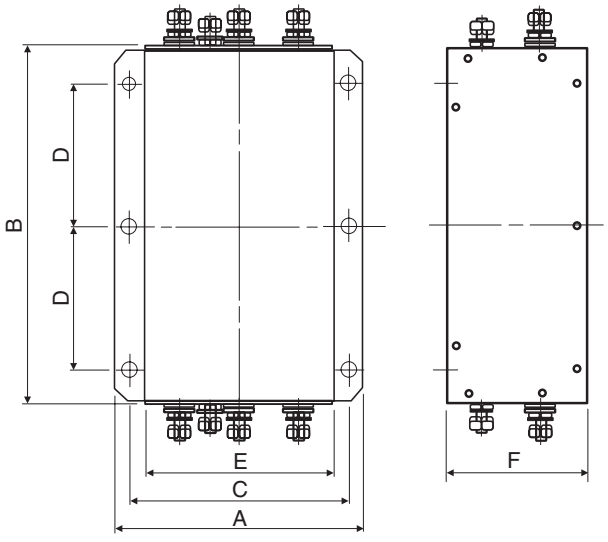
Filter	Inverter FR-F740	A	B	C	D	Weight [kg]
FFR-A540-8A-SF100	00023–00052	150	260	315	50	1.5
FFR-A540-16A-SF100	00083	150	260	315	50	1.5
FFR-A540-30A-SF100	00126–00250	220	260	315	60	1.8

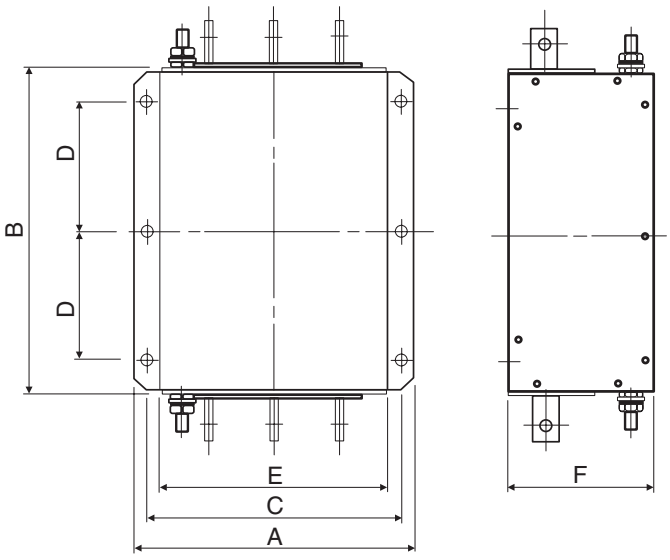
All dimensions in mm

Filter	Inverter FR-F740	A	B	C	D	G	Weight [kg]
FFR-F740-55A-SF100	00310/00380	221.5	300	360	80	M5	3
FFR-A540-75A-SF100	00470/00620	251.5	400	476	80	M5/M8	4.1
FFR-A540-95A-SF100	00770	340	550	626	90	M8	6.7
FFR-A540-120A-SF100	00930	450	550	636	120	M10	9.7
FFR-A540-180A-SF100	01160	450	550	652	120	M10	10.8

All dimensions in mm

Noise Filter FN 3359-180-28 and FN 3359-1600-99





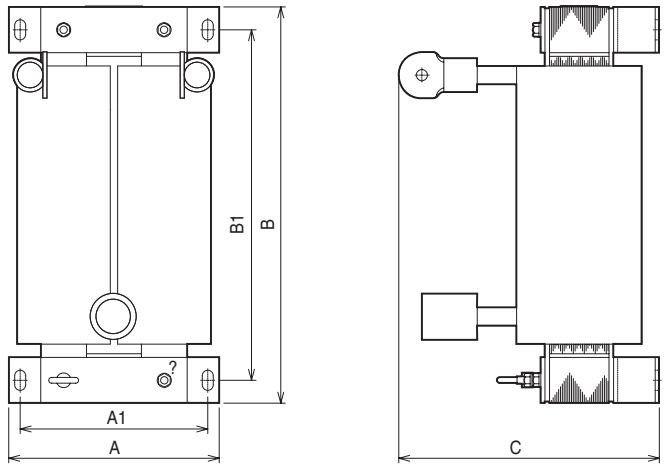
Filter	Inverter FR-F 740	A	B	C	D	E	F	Weight [kg]
FN 3359-180-28	01800	210	300	185	120	160	120	6.5
FN 3359-250-28	02160	230	300	205	120	180	125	7

All dimensions in mm

Filter	Inverter FR-F 740	A	B	C	D	E	F	Weight [kg]
FN 3359-400-99	02600–03610	260	306	235	120	210	115	10.5
FN 3359-600-99	04320–05470	260	306	235	120	210	135	11
FN 3359-1000-99	06100–09620	280	356	255	145	230	170	18
FN 3359-1600-99	10940–12120	300	406	275	170	250	160	27

All dimensions in mm

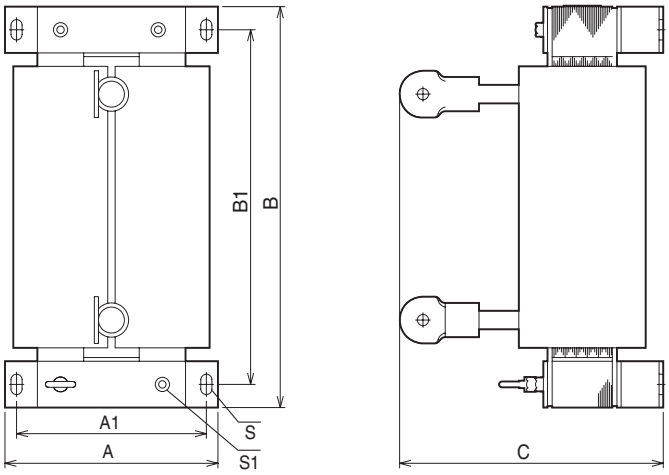
Converter Choke FR-HEL-H90K



Choke	A	A1	B	B1	C	Weight [kg]
FR-HEL-H90K	150	130	340	310	190	20

All dimensions in mm

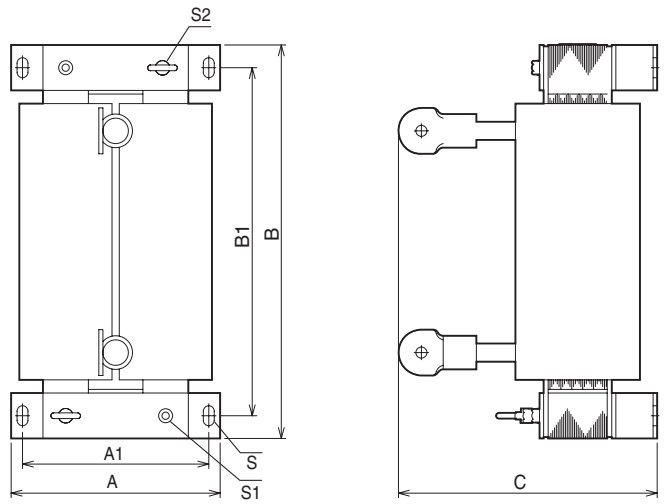
Converter Choke FR-HEL-H110K – 160K



Choke	A	A1	B	B1	C	S	S1	Weight [kg]
FR-HEL-H110K	150	130	340	310	195	M6	M6	22
FR-HEL-H132K	175	150	405	370	200	M8	M6	26
FR-HEL-H160K	175	150	405	370	205	M8	M6	28

All dimensions in mm

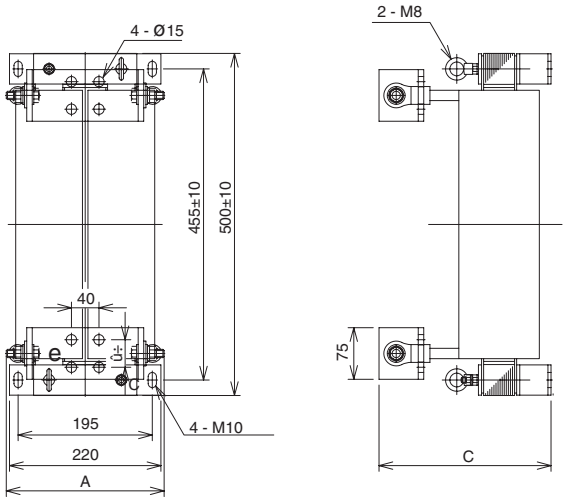
Converter Choke FR-HEL-H185K – 355K



Choke	A	A1	B	B1	C	S	S1	S2	∅	Weight [kg]
FR-HEL-H185K	175	150	405	370	240	M8	M6	–	M12	29
FR-HEL-H220K	175	150	405	370	240	M8	M6	M6	M12	30
FR-HEL-H250K	190	165	440	400	250	M8	M8	M8	M12	35
FR-HEL-H280K	190	165	440	400	255	M8	M8	M8	M16	38
FR-HEL-H315K	210	185	495	450	250	M10	M8	M8	M16	42
FR-HEL-H355K	210	185	495	450	250	M10	M8	M8	M16	46

All dimensions in mm

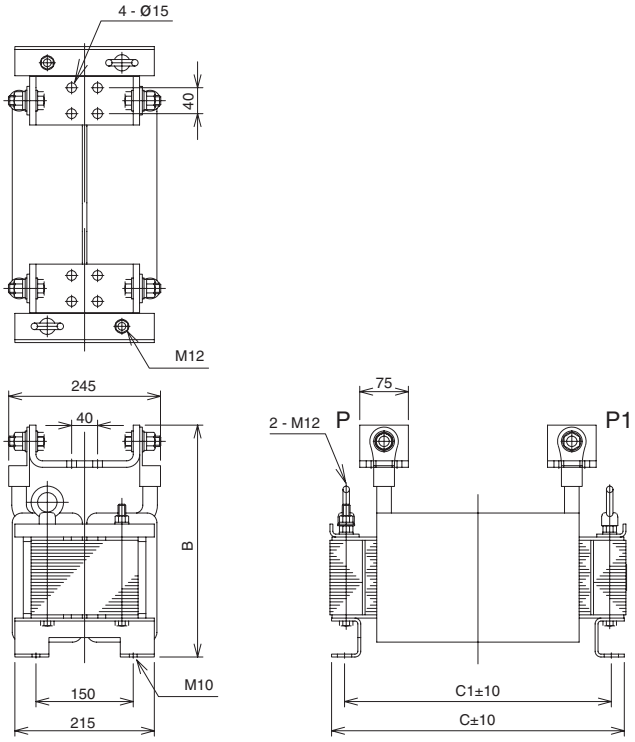
■ Converter Choke FR-HEL-H400K – 450K



Choke	A	C	Weight [kg]
FR-HEL-H400K	235	250	50
FR-HEL-H450K	240	270	57

All dimensions in mm

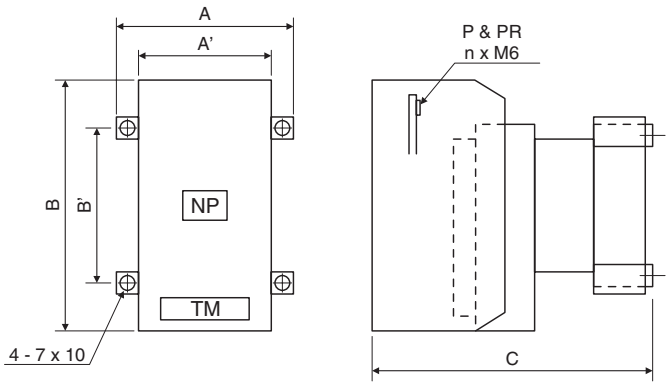
■ Converter Choke FR-HEL-H500K – 630K



Choke	B	C	C1	Weight [kg]
FR-HEL-H500K	345	455	405	67
FR-HEL-H560K	360	460	410	85
FR-HEL-H630K	360	460	410	95

All dimensions in mm

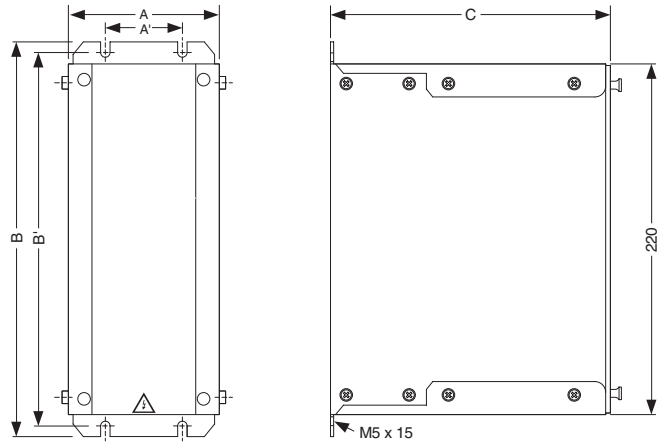
Brake Units MT-BU5



Brake unit	A	A'	B	B'	C	Weight [kg]
MT-BU5-H75K	118	90	200	100	256.5	1.5
MT-BU5-H150K	188	160	200	100	256.5	3.0
MT-BU5-H220K	258	230	200	100	256.5	4.5
MT-BU5-H280K	328	300	200	100	256.5	6.0
MT-BU5-H375K	398	370	200	100	256.5	7.5

All dimensions in mm

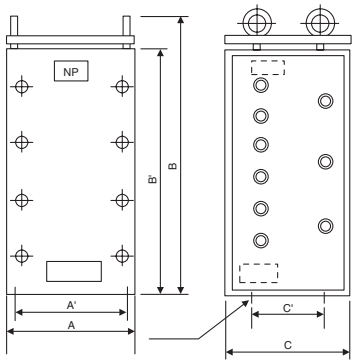
Brake Units BU-UFS



Brake unit	A	A'	B	B'	C	Weight [kg]
BU-UFS22	100	50	250	240	175	2.5
BU-UFS40	100	50	250	240	175	2.5
BU-UFS110	107	50	250	240	195	3.9

All dimensions in mm

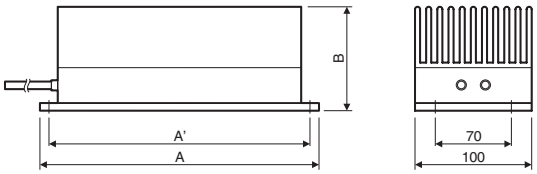
External Brake Resistor MT-BR5



Brake resistor	A	A'	B	B'	C	C'	Weight [kg]
MT-BR5-H75 k	510	480	885	800	465	300	70

All dimensions in mm

External Brake Resistor RUFC



Brake resistor	A	A'	B	Weight [kg]
RUFC22	310	295	75	4.7
RUFC40	365	350	75	9.4
RUFC110	365	350	75	18.8

All dimensions in mm

Please use the address of your local distributor. See details on back cover

Company: . . . . . .
Department: . . . . . .
Street: . . . . . .
Address: . . . . . .
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Order declaration

Pos.	Number	Item (type)	Article number	Description	Remarks

Notes when ordering:
When ordering, please use only the type designations and order numbers shown in this catalogue.

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